MODERN PLASTICS

mp

JANUARY 1952

WATER can't cramp your product's performance

NURSING BOTTLE CAP
Pyramid Rubber Co.

ENGINE DEHYDRATOR
Clark Metal Products Co.

TOILET TANK FLOATS
Plano Molding Co.

COMMERCIAL HUMIDIFIER
Daffin Mfg. Co.

... when it's custom molded of DUREZ phenolics

● Water resistance should seldom be overlooked in materials selection, and often it is a controlling factor.

This characteristic is outstanding in Durez phenolics and, as these examples suggest, it can serve you in many ways. Frequent contact with hot liquid causes no deterioration in the sanitary screw-on nursing bottle cap and nipple holder. Toilet tank balls of Durez float for years. Engine dehydrator plugs are unaffected by any climatic conditions and have the torque strength needed for a tight screw fit. Constant exposure to water vapor neither swells, shrinks nor warps the humidifier parts of molded Durez, nor mars their lustrous finish.

In millions of pieces of electrical and electronic equipment the low water absorption of Durez is equally important... it safeguards the excellent electrical characteristics of the material.

Your custom molder will help you get maximum profit from the electrical, chemical, and mechanical properties available in more than 300 Durez molding compounds. Why not see him now, before future plans become 'set'? Our field staff is at your service for details and technical assistance.

DUREZ

PHENOLIC RESINS

MOLDING COMPOUNDS

INDUSTRIAL RESINS

PROTECTIVE COATING RESINS

Our monthly "Durez Plastics News" will keep you informed on industry's uses of Durez. Write, on office letterhead, to Durez Plastics & Chemicals, Inc., 1201 Walck Road, North Tonawanda, N. Y.

PHENOLIC PLASTICS **THAT FIT THE JOB**

MODERN PLASTICS*

VOLUME 29 | JANUARY 1952 | NUMBER 5

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Modern Plastics, published monthly by Modern Plastics, Inc., at Emmett St., Bristol, Conn. Executive and Editorial Office: 575 Madison Ave., New York 22, N. Y. Published each month by Modern Plastics, Inc. Entered as second class matter at the Post Office at Bristol, Conn., December 14, 1950, under the act of March 3, 1879.

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*Reg. U.S. Pat. Office

Another new development using

B. F. Goodrich Chemical Company *raw materials*

Bright Idea at a Dam Site!

A dramatic example of GEON'S versatility!

Dams are built in huge concrete sections and there has always been trouble where two blocks join. Strip copper and other materials were used as water stops to prevent leakage when the concrete shrinks. Some proved unsatisfactory or too costly—then an engineer developed this water stop made of Geon polyvinyl plastic, shown above.

This extruded water stop comes in lengths of 100 feet and is cut up by a saw or knife to the right length. It is easy to install—sections are simply welded together by applying a torch or electric knife to the ends and pushing together. Because it is made of Geon, the water stop resists chemical action of concrete, temperature changes and is economical in both labor and materials.

This principle of Geon plastic joint seal may start you thinking of other uses where Geon's many advantages fill the bill.

For versatile Geon materials—including resin, latex and compounded plastics—have hundreds of uses. They resist heat and cold, weather, aging, and most chemicals. They take any color, brilliant or delicate as desired. Perhaps Geon materials can help you solve a problem, improve or develop a product. We'll help with technical advice. For information, please write Dept. GA-1, B. F. Goodrich Chemical Co., Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ontario. Cable address: Goodchemco.

Geon Polyvinyl Materials

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors

Need **BIG** molded plastics parts in **BIG** volume?

SEE CHICAGO MOLDED

Yes . . . we're equipped to turn out the biggest molded plastics parts made . . . in volume. And not only that . . . we can turn 'em out fast . . . and economically Size *and* quantity present no problems.

It sounds easy . . . and it is for us. But it calls for a rare combination of factors . . . the right equipment and plenty of it plus a know-how that has come with more than 32 years experience . . . a combination that few molders can equal.

Perhaps that's why, year after year, the biggest names in industry come to Chicago Molded for plastics parts of all shapes and sizes. For example . . . we're turning out hundreds of these 22 lb. Motorola TV cabinets every day . . . molding them two at a time. And this is just one of the many extra large units that carry the CMPC mold mark.

Of course, we mold small parts, too . . . millions of them. We have every needed type and size of equipment for compression, injection and transfer molding. So . . . no matter what your requirements may be, you'll find it good business to discuss plans with a Chicago Molded engineer. Just write, wire or phone. There's no obligation.

CHICAGO MOLDED
PRODUCTS CORPORATION
1046 N. Kolmar Avenue • Chicago 51, Illinois

Needed: New Approach to New Markets

Anyone with imagination who studies our report on the expansion plans of the plastics materials makers, beginning on page 93 of this issue, must be impressed with the *need* for new and intensified market research and market development in this industry.

And anyone who follows the business pages of the daily press and the statistical offerings of the business press, in which are noted present and coming shortages of metals and other materials, must recognize the obvious *opportunities* for plastics.

We have plastics. But we're going to have more plastics. Plenty more plastics. We're going to have more plastics because, first, it's not possible to set up new and additional production facilities for limited quantities of plastics materials; second, because men with imagination at high management level in the chemical industries can see tremendous future requirements which justify the planned expansions.

We're going to have more plastics, and they'll be needed. They'll be needed to supersede other less effective materials in thousands of applications. They'll be needed to improve products, lower the cost of products, make products easier to merchandise. They'll be needed for products not yet invented. They'll be needed in industry, in domestic applications, and in defense.

It is years since we have had to apologize for misapplications of plastics, because the relative number of misapplications today is picayune. We need no longer permit our materials to be called "substitutes" by anybody. We need offer no apologies for anything. We can face future tasks with the firm prospect of outstanding success, because of our record and that of our materials in recent years.

But—who has the responsibility for market research and market development?

Five years ago, this responsibility might have been accepted by the material makers only. Not so today. With so many different materials available, with so many different types of applications for each material, with so many applications involving a number of different materials, this vertical paternalistic approach to market development simply will no longer work.

The material makers will, of course, continue to develop basic new markets for their plastics, and will continue to promote the appreciation of plastics. But it is up to every last molder, fabricator, processor, to look to his own future markets for the materials he knows and for the applications he is best equipped to handle.

This is going to take imagination, intestinal fortitude, and money. It is going to take time and effort and thought. But it will pay off.

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Executive and Editorial Offices

575 Madison Ave., New York 22, N. Y.
Tel., PLaza 9-2710

Branch Offices

Chicago 11: 101 E. Ontario St.
J. M. Connors — Tel., Delaware 7-0060

Cleveland 14: 815 Superior Ave.
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MODERN PLASTICS is regularly indexed in Industrial Arts Index and Industex.

THIS GIANT FILTER PLATE

RICHARDSON is molding it from a NEW Corrosion-Resistant Plastic —developed in the RICHARDSON LABORATORIES

● Sparkler Manufacturing Company, Mundelein, Illinois, faced a tough material problem in designing this 33-inch filter plate weighing 24 pounds for their filtering unit. The filter plate had to withstand the corrosive action of a variety of hot solutions — ranging from weak to strong acids and alkalies. Furthermore, the material had to be strong and non-sagging, with good dimensional stability.

Richardson plastics engineers were called in to help because of their wide experience in material development and part design, and because Richardson molding facilities are unmatched in the industry. Richardson developed a *new* corrosion and heat-resisting plastics material for the job, and precision-molded the part to Sparkler's exact requirements.

Write for illustrated INSUROK Folder

Consult Richardson on Your Special Plastics Jobs

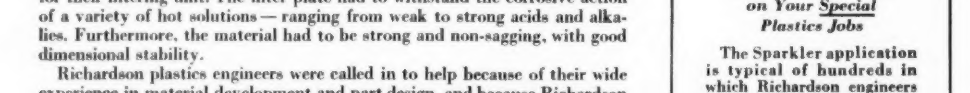
The Sparkler application is typical of hundreds in which Richardson engineers have solved difficult plastics problems for industry. The Richardson Company's unique 4-point plastics service—Materials Development, Engineering, Molding, and Laminating — are available for your benefit.

The RICHARDSON COMPANY

FOUNDED 1858—LOCKLAND, OHIO

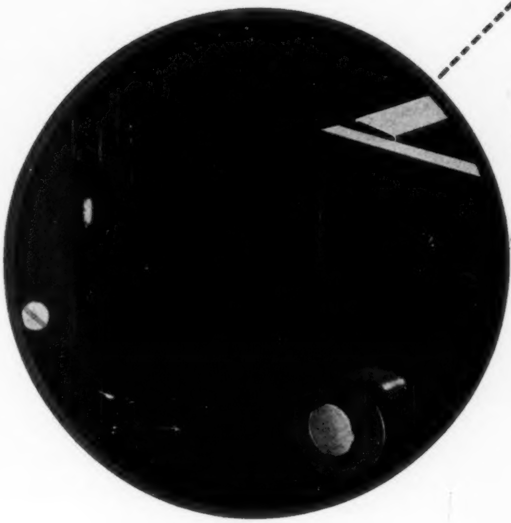
2789 Lake St., Melrose Park, Illinois (Chicago District)

INSUROK
Laminated and Molded Plastics



MELROSE PARK, ILL. INDIANAPOLIS, IND. NEW BRUNSWICK, N. J. NEWNAN, GA. TYLER, TEX. OGDEN, UTAH

Rollers of Du Pont nylon need no lubrication



Insert shows nylon rollers on stove support. The part is injection-molded by Sinko Manufacturing & Tool Co., Chicago, Ill.; range made by Murray Corp. of America, Scranton, Pa.

provide quiet and easy operation of stove drawers

When this manufacturer of gas and electric ranges set out to design a stove with a warmer compartment and storage drawers that would never stick or get noisy, the engineers were up against an old problem. In kitchen equipment, quiet and easy operation of drawers without lubrication has always been difficult to attain, and few housewives bother to oil them.

Rollers injection-molded of Du Pont nylon, requiring no oiling, proved to be the solution. Nylon does the job because of its unique bearing properties. Its low coefficient of friction makes lubrication unnecessary. Because nylon damps vibration, drawers operate quietly. And heat-resistance of nylon keeps rollers from deforming even when the stove is hot. In a series of tests, nylon rollers showed such strength and wear-resistance that the manufacturer reports they will operate smoothly and quietly for the life of the range.

This is only one example of how molded nylon is helping manufacturers of household equipment to overcome problems. Other such uses include rollers for sliding doors, drapery slides, latch bolts for doors, and refrigerator door-lock rollers.

And in many other fields, Du Pont nylon plastic is finding many applications as an engineering material. It may pay you to investigate its properties. For additional information on nylon and other Du Pont plastics, write:

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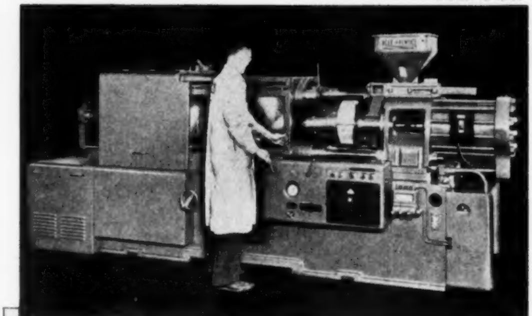
REED-PRENTICE

OUT IN FRONT

with 2500 machines!

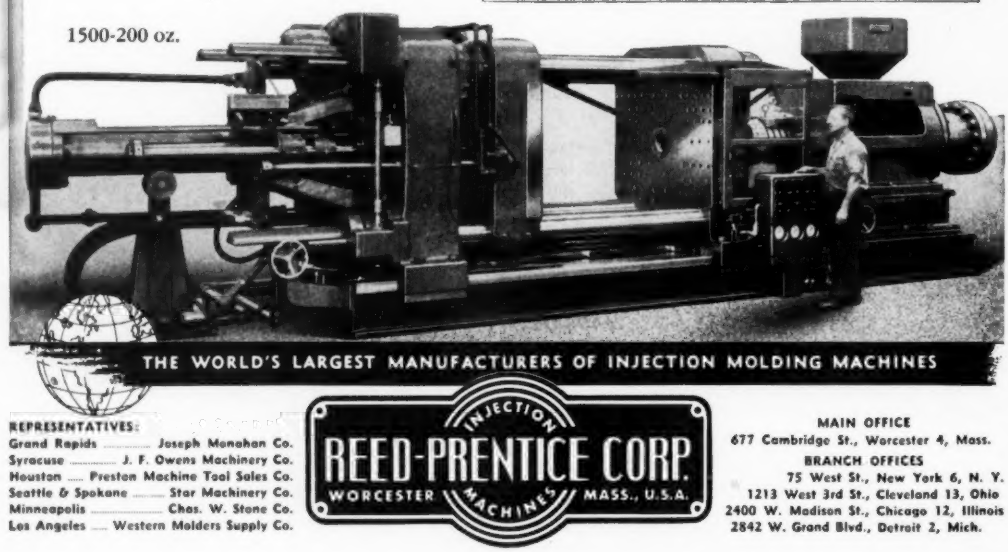
10D-8 oz.



Whenever injection molding machine statistics are revealed, you can be sure of one thing . . . Reed-Prentice leads the field again . . . this year with more than 2500 machines manufactured since 1936. Of this total, 1589 presses are the popular 10D-8 oz. model — the real "workhorse" of the plastics industry. The big 1500T-200 oz. machine has the rugged efficiency of the 8 oz. model and incorporates new engineering features which make it the leader in its range. To get the full story on all "Reeds" — from 2 to 200 ounces — write for Catalog No. 30.

Specifications	4 oz.	8 oz.	12 oz.	16 oz.	24 oz.	32 oz.	200 oz.
Die locking pressure, tons	125	275	275	400	600	600	1500
Rated Casting area, sq. in.	50	125	125	150	300	300	700
Mold opens	8″	10¼″	10¼″	16″	24″	24″	36″
Max. die space	12″	16″	16″	24″	28″	28″	40″
Size of die plates	16x21″	21x25″	21x25″	40x45″	45x54″	45x54″	60x72″
Weight, lbs.	9700	12,850	16,250	31,500	45,100	46,100	92,000

1500-200 oz.



THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

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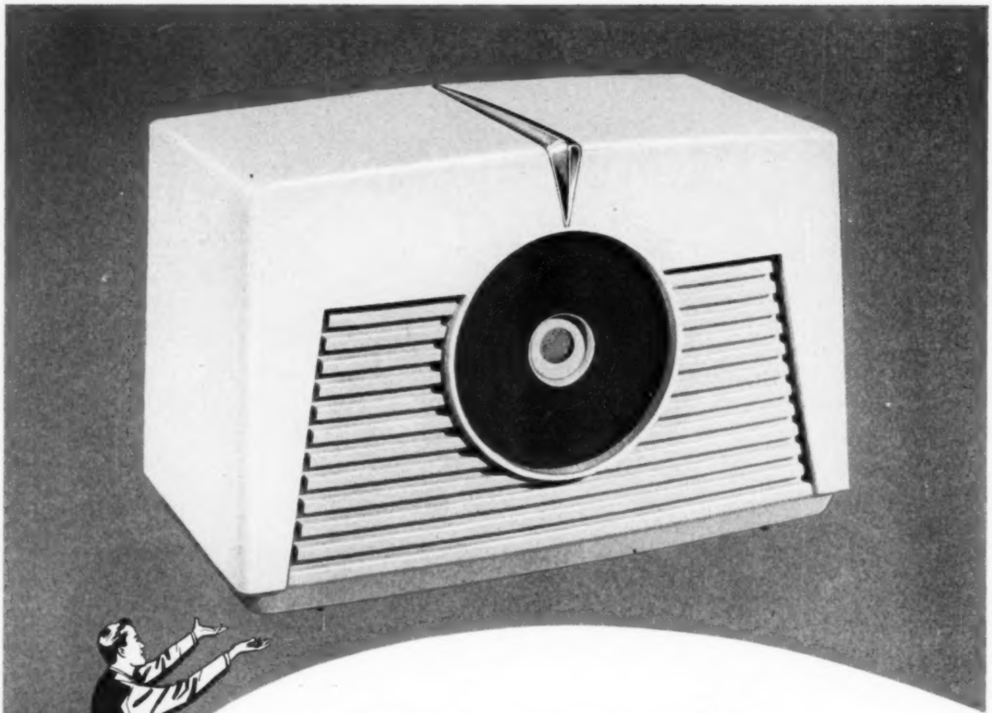
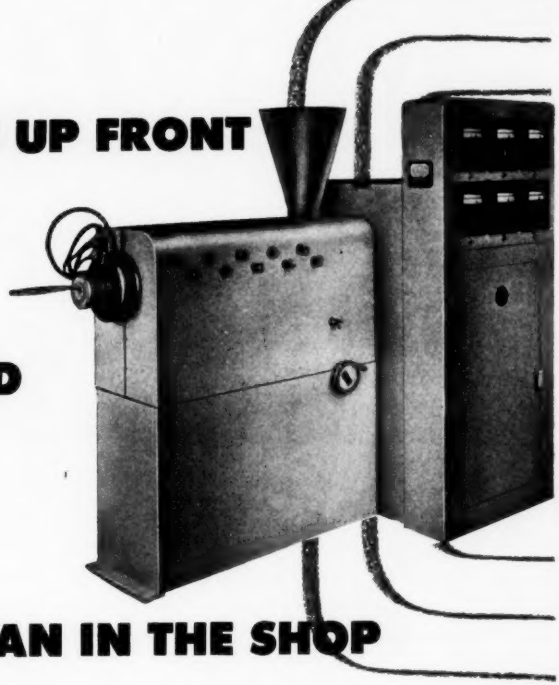



PRP

THE MAN UP FRONT



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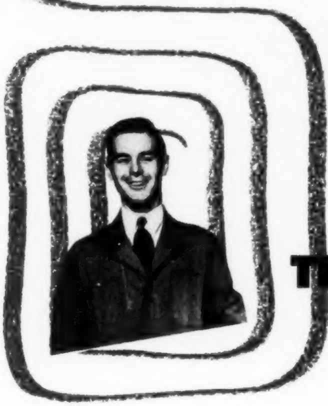

THE MAN IN THE SHOP

agree on mpm extruders

The man in the front office whose prime concerns are initial costs, production rates and eventual replacement, and the fellow in the shop who has to think about tolerances and surface finish are in accord when it comes to choosing an extruding machine. They both vote for MPM!

This preference is not matter of whim. The outstanding construction and operating features of MPM extruders offer compelling reasons why they *should* be preferred by both owners and technical men.

Take the matter of long life for instance. Because all parts which contact plastic resin — hopper, screw, cylinder, strainer, die head — are not plated, but constructed of solid corrosion resistant materials, maximum wearing qualities are assured.

And for the production man, precision control of tolerances is simplified by the most advanced heat control system in the extrusion field, and by ample vari-speed drives with accurately regulatable speed adjustments.

These reasons, important as they are, just scratch the surface. We will gladly explain the many additional advantages of MPM extruders to your management or technicians. Write for details.

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WEST COAST PLASTICS DISTRIBUTORS, INC.
2325 Jesse Street, Los Angeles 23, Cal.

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Cable Address: MODPLASEX

BEHIND *The Story of*

STANDS THE

W-S "Completeline"...

THE SHORTEST DISTANCE BETWEEN PRODUCTION AND PROFIT

In a fast-paced industry like that of plastics molding, news becomes history almost over night. Only a few years ago, W-S was pioneering the "big" injection machines—eight, then 12, then a fabulous 16 ounces! Now, Watson-Stillman's high-speed production giants—the size of small locomotives — shoot almost 20 *pounds* per cycle.

Yes, plastics molding has come of age. What started only yesterday as a manufacturing business has become a major industry . . . its applications tested and proved . . . its markets huge and growing . . . its materials and products pronounced "critical" in the most vital fields of civilian and defense production.

W-S is proud of its right to claim an associate editorship in the "writing" of this typically American success story—the encyclopedia of plastics molding. We have worked closely with its chief editor—the molder himself—in developing the most complete line of production machinery anywhere available.

Always reflecting, and frequently anticipating the molders' needs, W-S has developed machinery ranging from one to 300 ounces capacity, and including complete installations for every material and method commercially employed in molding by compression, transfer, and injection techniques.

This kind of close association with the beginning, development, and assured *future* of the industry makes W-S more than ever your logical first-choice consultant on your present expansion or new-plant planning.

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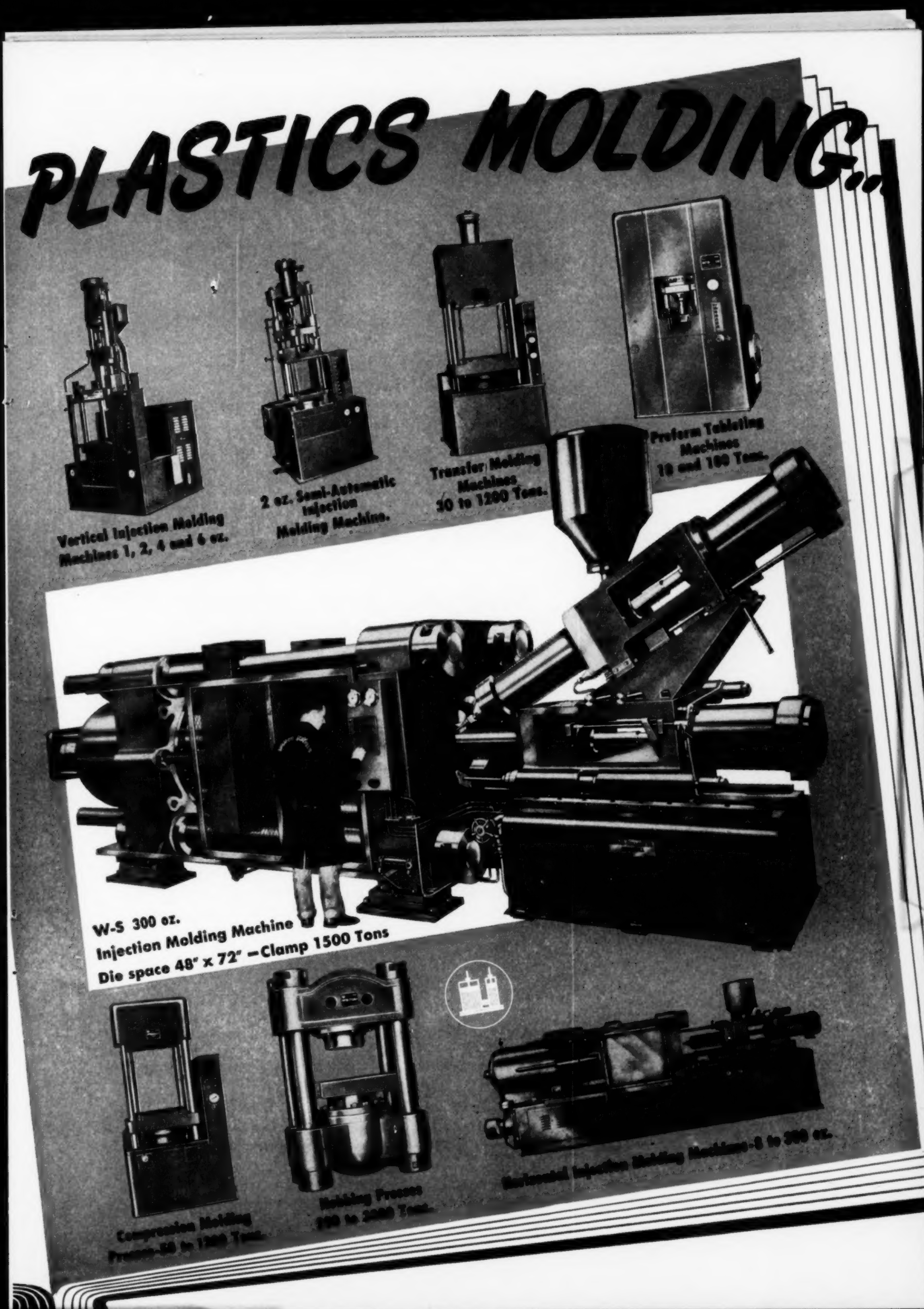
PLASTICS MOLDING...
Vertical Injection Molding Machines 1, 2, 4 and 6 oz.
2 oz. Semi-Automatic Injection Molding Machine.
Transfer Molding Machines 30 to 1200 Tons.
Preform Tableting Machines 10 and 100 Tons.
W-S 300 oz.
Injection Molding Machine
Die space 48" x 72" —Clamp 1500 Tons
Compression Molding

8 *Important Reasons—*

why it pays Material Manufacturers, Compounders and Molders

to insist on

CADMOLITH*

REDS AND YELLOWS

(Cadmium Red and Yellow Lithopone)

FOR PLASTIC MATERIALS

- **Soft and Easy to Grind**
- **Insoluble in all Vehicles**
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- **High Heat Resistance**
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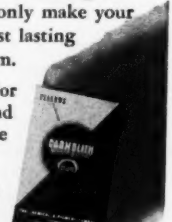
Whether you are a material manufacturer, a compounder of new or old materials or a plastic molder or coater . . . you can always depend on Glidden Cadmolith* Colors for the finest results in red and yellow shades. Glidden leadership in research has given these superior colorants properties which not only make your coloring job easier, but produce the finest, most lasting colors in powders and products made from them.

Send for Folder giving complete details, with color chips. Write The Glidden Company, Chemical and Pigment Company Division, Union Commerce Building, Cleveland 14, Ohio.



Where a higher degree of opacity is required, *Pure* Cadmium Reds are available in the same range of shades as our Cadmolith* Red.

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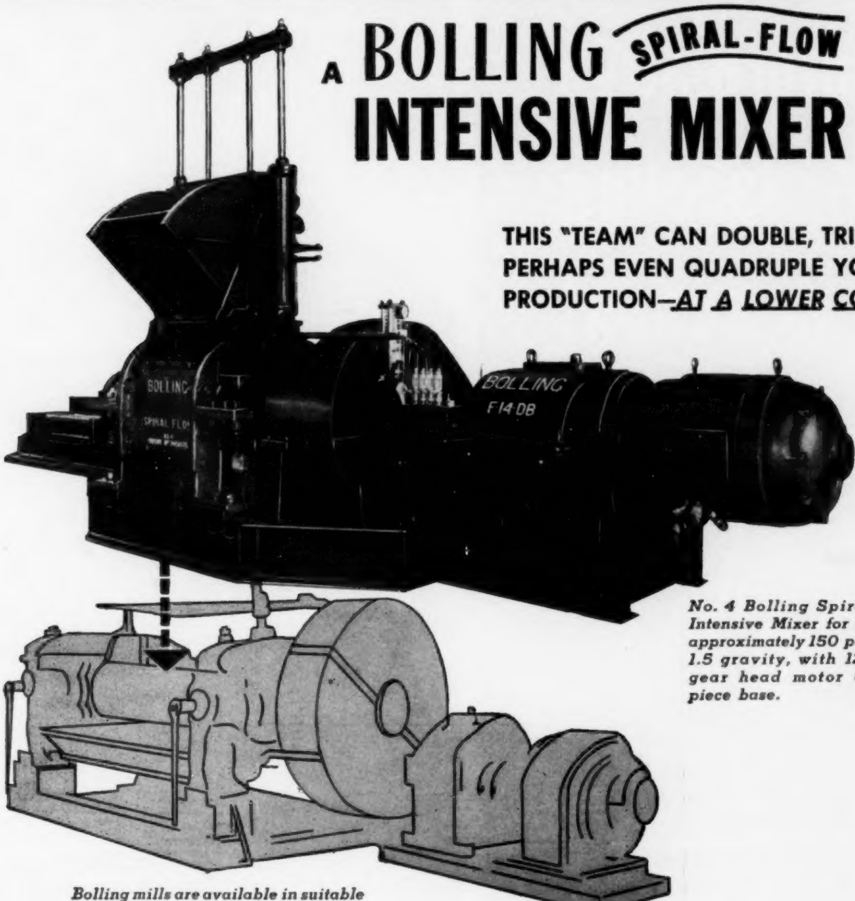
PUT IT TO WORK WITH THE PROPER MILL . . .

A BOLLING SPIRAL-FLOW INTENSIVE MIXER

THIS "TEAM" CAN DOUBLE, TRIPLE, PERHAPS EVEN QUADRUPLE YOUR PRODUCTION—AT A LOWER COST.



No. 4 Bolling Spiral-Flow Intensive Mixer for batch of approximately 150 pounds of 1.5 gravity, with 125 h. p. gear head motor on one-piece base.

Bolling mills are available in suitable sizes for the efficient, economical sheeting of plastics or rubber.

Write today for our new Bulletin "P-1".

Yes, sir, we mean just that! Bolling Spiral-Flow Intensive Mixers have been known to jump production 300% and cut mixing costs 70%. Bolling's 30-year background is ready to show you how you possibly can do likewise. These distinctive Bolling features will help:

1. Spiral-Flow steel sides which turbulate water or steam for hastening maximum heat transfer.

2. Split end frames for rigidity and quick accessibility.

3. Anti-friction bearings maintain true centers, reduce power maintenance and practically eliminate end play in rotors.

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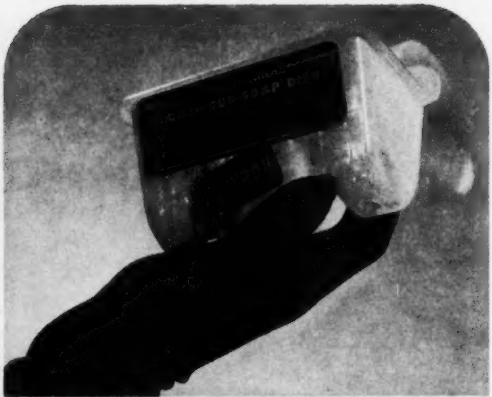

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YOU SIMPLIFY INSTALLATION AND INSTRUCTION with Kum-Kleen Labels because they get through to the people who need to know.

Whether you are a plastics fabricator producing consumer goods, industrial articles or in defense production, Kum-Kleen, the *Informative Label,* can help you as it has hundreds of others and often at a fraction of the cost of other methods. Kum-Kleen Pressure-Sensitive Labels and plastics were made to go together. They stick-and-stay-stuck (even to curved surfaces), they will not pop or curl, yet will easily peel off when their job is done. They have everything a manufacturer desires in an Informative Label. Yes, everything including speed of application which puts labeling on a production-line basis.

Avery's new Electric Dispenser delivers labels to the operator's hands ready to be applied without moistening as fast as they can be placed on the product. One person often does the work of four. So, investigate the economy, the efficiency and the importance of Kum-Kleen—the Informative Label. Write for samples and prices.

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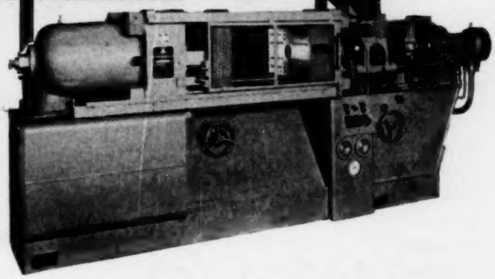
START *Right!*

with the *fastest* Machine in The Industry

H-P-M's NEW "9"



● 10 SECOND CYCLE . . . on actual installations . . . think of it! Yes, everybody is talking about H-P-M's new "9", the fastest cycling machine of its size in the industry—the machine that's delivering more saleable parts per hour than any other comparative machine.

NEW, ADVANCED DESIGN features the latest improvements in feeding mechanism, plasticizing chamber, knock-outs, mold slow-downs, etc.

FOR EASY MAINTENANCE and time-saving convenience, H-P-M pumps, valves and piping are mounted on the outside . . . easy to get at.

DESIGNED FOR CONVERSION TO PRE-PLASTICIZING (optional extra) which triples plasticizing and shot capacities of conventional 9 oz.

Now is the time to start that molding operation you've been thinking about . . . plastic materials are readily available . . . no allocations now! And, H-P-M's new "9" is the ideal machine for the job. It has the capacity to handle a wide range of mold sizes and turns out both shallow and deep section parts equally well. Start that new injection operation now and start it right with the most popular molding machine on the market—the new H-P-M "9".

ANOTHER NEW PLANT—starting production expansion right with new H-P-M 9's is the Earl Fisher Plastics, Inc., plant at Columbus, Ohio, using H-P-M's exclusively.

H-P-M's NEW 9's ARE DOING A REAL JOB IN THESE WELL-KNOWN PLANTS . . .

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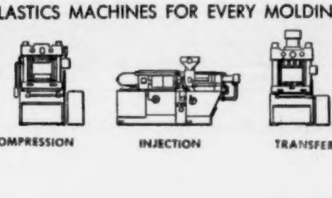
- Parker Pen
- Minnesota Plastics
- General Electric
- Santay
- Ideal Plastics
- Consolidated Molded Products
- Minnesota Mining & Mfg. Co.
- Plastex
- Ontario Plastics

(There're many more . . . but why not ask one of these molders about H-P-M's new 9 oz.)

HPM *Write for full details today!*

PLASTICS MACHINES FOR EVERY MOLDING JOB



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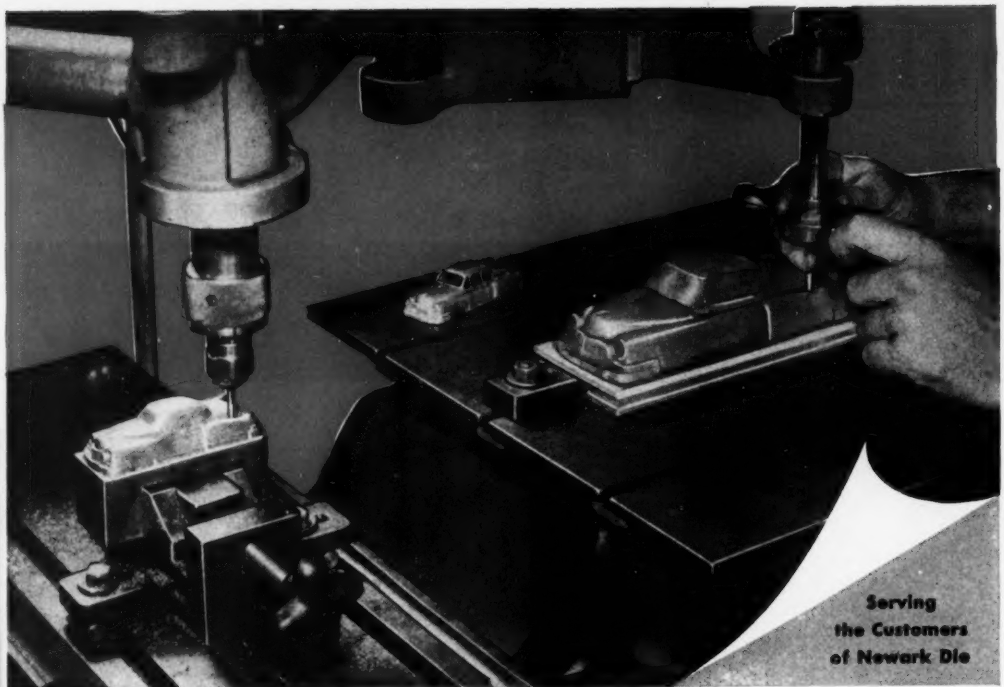
The John Wesley Hyatt Award is offered annually for outstanding achievement in the field of plastics. The Award is made by the Committee to that individual who, in its opinion, made the greatest contribution in 1951 to the progress of the plastics industry. The winner receives the John Wesley Hyatt Gold Medal and $1,000.

Entries are invited from *everyone* in the plastics industry . . . *all* molders, fabricators, laminators, extruders, reinforced plastics processors, film and sheeting producers and printers, molding equipment manufacturers, and raw material producers . . . as well as chemists, laboratory technicians, toolmakers and executives. There is no entry fee.

Statements of qualification (Entry Blanks) are now in the mail to the industry. Additional blanks or further information may be obtained from the Committee Secretary, William T. Cruse, 67 West 44th St., New York 17, N. Y.

CP52-1



3 Dimensional Pantographs

ENGRAVE DESIGNS FROM MODELS OF ALMOST ANY SHAPE OR CONTOUR

The hands of a skilled craftsman on the tracer of a 3-dimensional pantograph at Newark Die Company transmit the movement to the cutter spindle—to engrave designs quickly and accurately, regardless of shape or contour.

Through such modern machine tool facilities, the blueprints of Newark Die engineers are accurately translated into finished molds. Added floor space and modernized materials handling equipment now enable Newark Die to serve its customers with even greater promptness and efficiency.

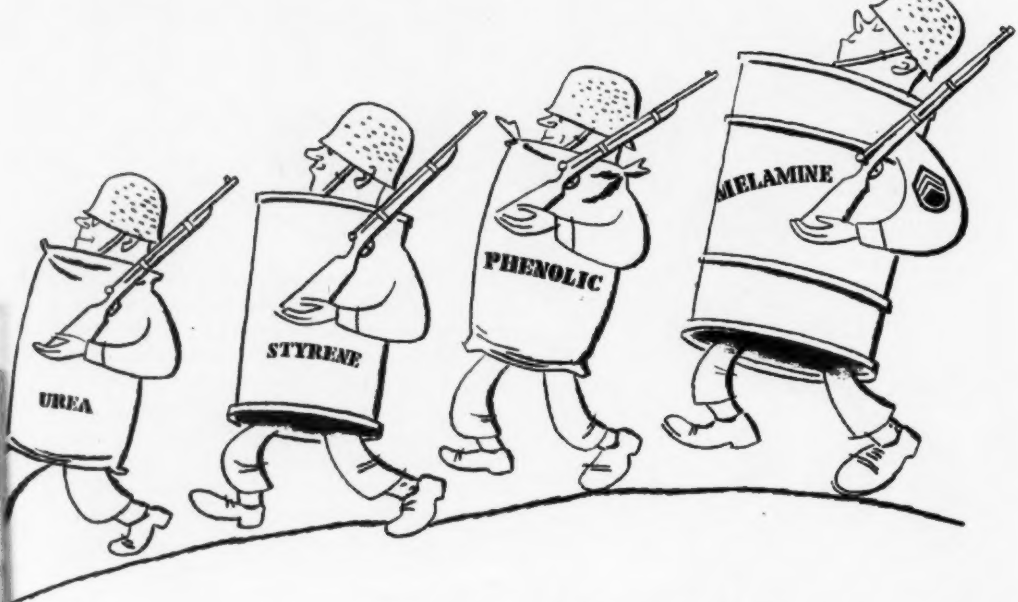
NEWARK DIE COMPANY

22 SCOTT STREET, NEWARK 2, N. J.

Phone: MArket 2-3305

NDCO TRADE MARK

LET THE SUBSTITUTOR BEWARE



Listen, my children, and you shall hear
The woeful tale of an engineer.

Who looked at Plastics in a sour mood
And came to conclusions exceedingly crude.

He called them replacements, possibly saleable
If old time materials should not be available.

His rivals went forward, rebuilt for the trade,
Their whole line of items of Plastics are made.

They're strong and they're rugged and better by far
And they cost so much less that the price is no bar.

So our engineer has changed his vocation
His boss saw to that with some foot motivation.

The moral is clear, shun getting the boots,
Don't neglect Plastics — they're not substitutes.

BOONTON MOLDING CO.

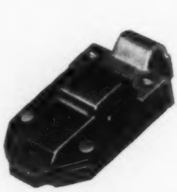
BOONTON, NEW JERSEY

NEW YORK OFFICE — CHANIN BUILDING, 122 EAST 42ND STREET, MURRAY HILL 6-8540

ROTARY CHOPPER
PREBREAKER
Cut up large plastic parts with the
CUMBERLAND machine
that's RIGHT FOR YOU!
PELLETIZER
CUMBERLAND
GRANULATING MACHINES
MODELS
0, ½, 1½
Small and medium capacity. Direct coupled for central grinding. V-belt driven for use beside each injection machine. Request Bulletin 250.
MODEL 10
Large 6" x 10" throat opening. For use beside each injection molding machine. Rugged, efficient, and easy to clean. Write for details.
MODEL 18
Large capacity. Double hung construction. Easy to inspect, dismantle, and adjust. Further details are in Bulletin 250.
YOU'LL SAVE MONEY, CHOP UP PLASTIC MORE EFFICIENTLY WITH A CUMBERLAND MACHINE THAT'S BUILT-FOR-THE-JOB
Your plastic reducing problems can only be solved by a machine designed to meet your needs..
Because Cumberland engineers realize this fact, they have designed and manufactured a complete line of plastic reducing machines — each built to perform better under specific operating conditions.
Let us know your requirements. We'll be glad to analyze your needs and recommend the Cumberland machine that's exactly right for you!
QUICK FACTS ABOUT CUMBERLAND MACHINES
NEW PREBREAKER: Cuts up television cabinets and other large parts. Available with 10" x 24" or 20" x 32" throat opening.
ROTARY CHOPPER: Versatile heavy duty machine. Cuts thick vinylite slabs. For other applications, request Bulletin 400.
PELLETIZER: Pelletizes plastic material from continuous extruders.
Write now for complete details!
CUMBERLAND Engineering Company, Inc.
BUILDERS OF BETTER MACHINES FOR THE PLASTICS INDUSTRY
DEPT 1 · BOX 216 · PROVIDENCE · RHODE ISLAND
California Representative:
WEST COAST PLASTICS DISTRIBUTORS, INC.
2325 Jesse Street, Los Angeles 23, Cal.

WHAT THEY'RE* USING FOR HIGH STRENGTH PARTS

. . . . *and why!*



*** BULLDOG ELECTRIC PRODUCTS COMPANY**

ROGERS RM-12338

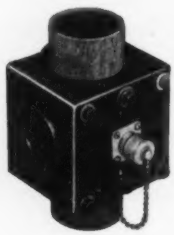
PART: Vacu-Break Switch Head

MOLDER: The RICHARDSON COMPANY

Strength and toughness to withstand punching, fabricating and riveting operations after molding.

Reduced the number of parts used in forming the head, thus effecting a substantial decrease in labor costs.

Mandatory for operation of Vacu-Break Switches that material used in HEADS have unusual stability and not be affected by atmospheric conditions.



*** AMERICAN PHENOLIC CORPORATION**

ROGERS RM-15000E

PART: Antenna coupling for Signal Corps

High impact strength.

Part, weighing one pound, was drop-tested from heights of 12 feet. Did not chip or crack.

*** LIONEL CORPORATION**

ROGERS RX-421

PART: Housings, switch bases, coil forms

Stands up under the shock of trimming and riveting on a punch press.

Provides a firm, non-cracking grip for self-tapping screws, eliminating need for metal inserts.

Smooth, gleaming surface assures eye appeal for visible components.

Better Parts for Better Products

ROGERS

CORPORATION

Established in 1832

Write for "Here's Rogers and Its Fiberloys" — Dept. P, Rogers Corporation, Manchester, Conn. This entertaining booklet will help you decide if our plastics and other Fiberloys by Rogers have a place in your products.

This *NEW*, 8-page bulletin provides an outline of the machinery, equipment and engineering service available to you from *the largest producer in the United States of rubber and plastics processing equipment.*

Page 2 describes the development of complete processing layouts by Farrel-Birmingham's Engineering Planning Division. Three schematic diagrams of typical setups are shown.

The next four pages are devoted to descriptions and illustrations of four of the company's principal lines of products — Banbury mixers, mills, calenders, and extruders for specialized production. Tables giving sizes and capacities of standard Banbury mixers and mills are also included.

Page 7 features rolls, which are designed and manufactured for practically any application. The last page describes power transmission equipment—speed reducing and speed increasing gear units, right angle vertical shaft drives and Farrel Gearflex couplings.

Send for a copy of this handy bulletin today. No cost or obligation.

FB-708

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT
Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham

FARREL-BIRMINGHAM COMPANY, INC.
Ansonia, Connecticut
Please send me a copy of bulletin 191, "MACHINERY, EQUIPMENT AND ENGINEERING FOR THE PROCESS INDUSTRIES".

Name____________________

Company____________________

Address____________________

City____________ State ______

SPOTLIGHT ON QUALITY!

Experience has established the merits of Sebacic Acid Esters as plasticizers. Their outstanding properties are:

- High efficiency
- High heat resistance
- Low temperature flexibility
- Water resistance
- Resistance to sunlight

For sebacates of highest quality,
Ask Hardesty.

THE KEY TO HARCHEM ® BETTER PLASTICS

HARDESTY CHEMICAL COMPANY, INC.

41 EAST 42nd ST. NEW YORK 17, N. Y.
MANUFACTURERS OF SEBACIC ACID

In tune with the time...

modern plastics pigmented with TITANOX

THE fresh, bright colors, tints and whites found in many appealing plastic products today are created with Titanox titanium dioxide pigments.

Phenolics, acrylics, vinyls, polystyrenes, cellulosics . . . in general, Titanox pigments are universally applicable to any type. Special types of Titanox pigments, however, may be indicated to secure certain desirable properties. For example, where maximum whiteness is required at minimum loading, TITANOX-RA is preferred. On the other hand, TITANOX-RCHT may be used at higher total pigment loading or in tints where the exceptionally high opacity of the "pure" titanium dioxide pigment is not needed.

If you have a plastics pigmentation problem, our Technical Service Department is always available for assistance. Ask your Titanox representative or write Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Boston 6; Chicago 3; Cleveland 15; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments Limited, Montreal 2; Toronto 1.

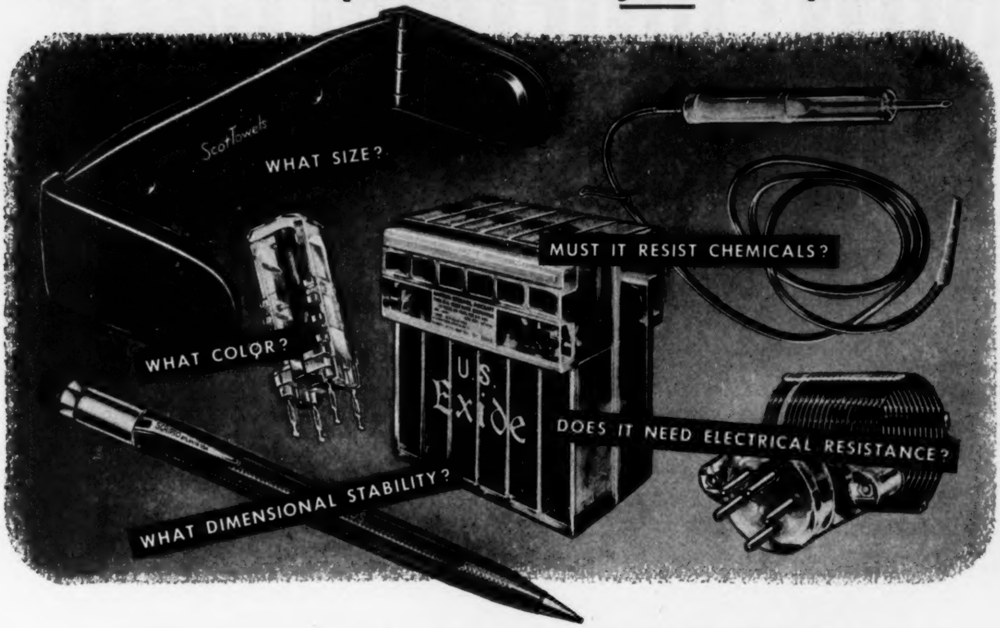
®TITANOX

the brightest name in pigments

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY

What are the requirements for your new product?



It will pay you to investigate Koppers Polystyrene!

WHEN YOU ARE CONSIDERING your product's appearance, durability, use, customer appeal and final cost, you should also consider the unusual adaptability of Koppers Polystyrene. It can be molded in practically any shape . . . its dimensional and heat stability assure exact fit between related members . . . it has high dielectric strength . . . beauty and stability of its color are unrivaled.

From the technical viewpoint, the excellent molding characteristics of Koppers Polystyrene result in fewer weld lines, improved strain pattern, more uniform plasticizing of material in the cylinder, faster molding cycles resulting from setting at higher temperatures, and a more uniform cylinder feed.

Write for further information. As always, we want to work with you to obtain the best results from your use of Polystyrene . . . to solve your particular molding problems . . . to design new products to be made from Koppers Polystyrene.

Koppers Polystyrenes give you all these advantages

Low cost
Light weight— more pieces per pound
Excellent dimensional stability
Excellent electrical properties
Heat-distortion temperature range: 165°- 200°F.
Good chemical and moisture resistance
Tasteless and odorless
Unlimited color range

Koppers Plastics make Many Products Better and Many Better Products Possible.

KOPPERS

[redacted]

KOPPERS COMPANY, INC., Chemical Division, PITTSBURGH 19, PA.

SALES OFFICES: NEW YORK · BOSTON · PHILADELPHIA · CHICAGO · DETROIT · LOS ANGELES

NOW! UNIFORM GAGE, UNIFORM COLOR

with TIMKEN® bearings on calender rolls

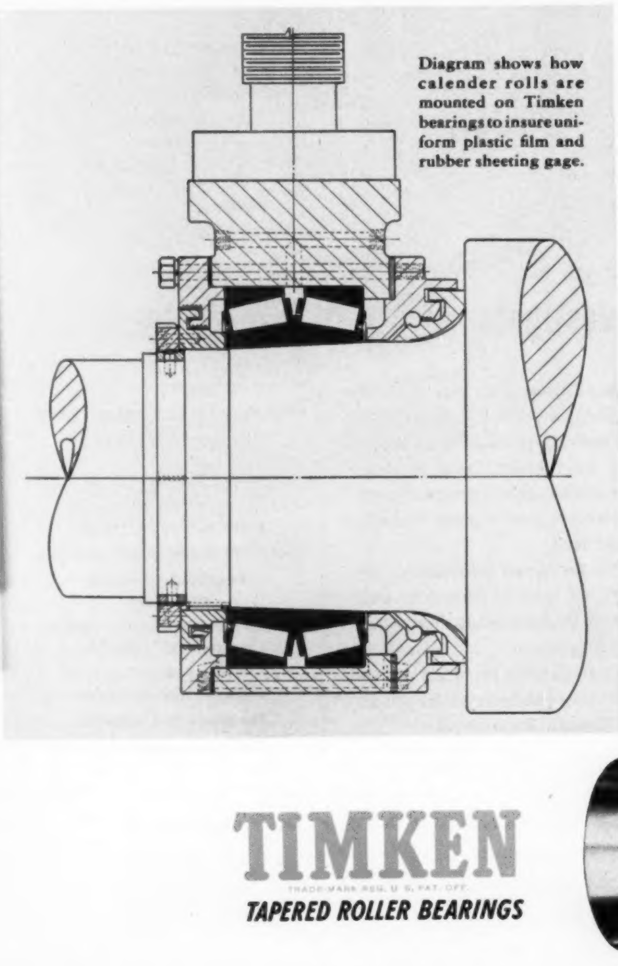


Diagram shows how calender rolls are mounted on Timken bearings to insure uniform plastic film and rubber sheeting gage.

IT'S now possible to get precision control of plastic film and rubber sheeting gage with calender rolls mounted on Timken® tapered roller bearings. Uniform gage and uniform color shades are assured. And losses due to rejects are cut to a minimum.

Timken bearings may be properly adjusted at installation to allow for roll neck expansion when the calender rolls come up to operating temperature—maintaining accurate control of gage. Vertical roll movement is minimized and calender precision maintained because Timken bearings hold rolls in positive alignment.

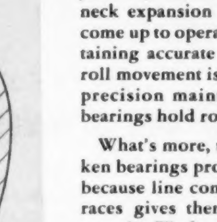
What's more, this precision lasts. Timken bearings provide greater roll rigidity because line contact between rollers and races gives them greater load carrying capacity. Timken bearings take both radial and thrust loads, practically eliminate friction due to incredibly smooth surface finish and true rolling motion. Roll neck wear is eliminated, maintenance costs are minimized.

Backed by over 50 years of bearing research and development, Timken bearings are first choice throughout industry. Be sure you specify them for the calenders, mills, refiners and mixers that you build or buy. For full information write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

the plant	**500,000 square feet devoted exclusively to injection molding**
the injection machines	**100 of them — ranging in capacity from 3 to 300 ounces**
the toolrooms	**2 multi-million dollar shops where Ideal's molds are built**
the monthly capacity	**4,200,000 pounds of molded thermoplastics**
the know-how	**gained in 16 years of injection molding products of every description**

The Chart Tells Why You Can Expect and Get More for Your Custom Molding Dollar from IDEAL World's Largest Injection Molder

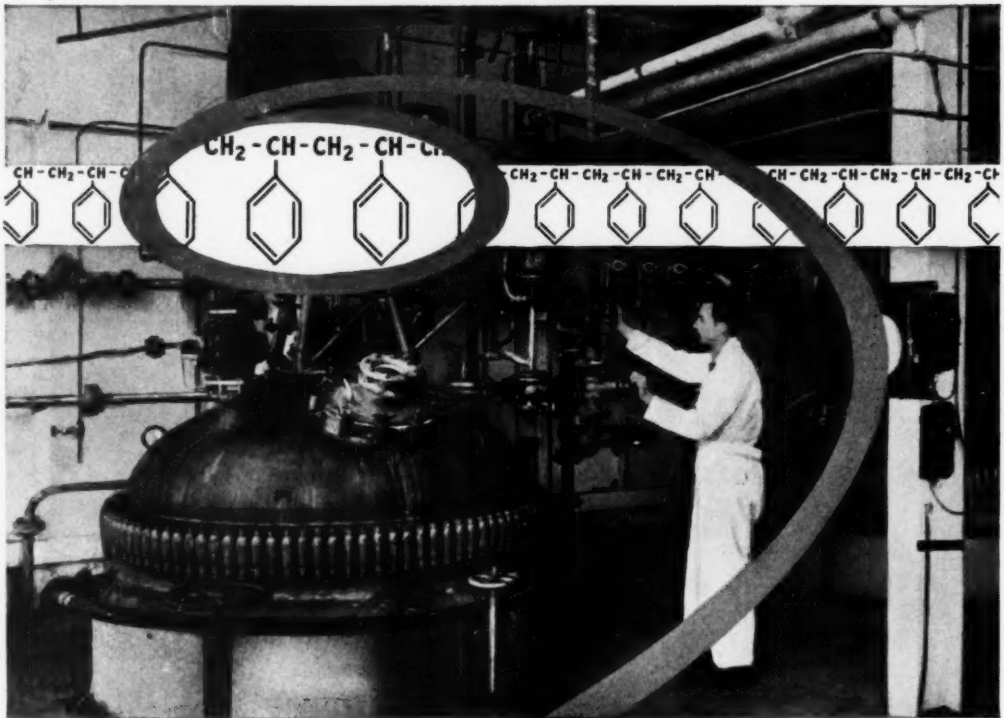
PARTICULARLY in these times of essential defense and civilian orders and of rising costs is it important for users of molded thermoplastics to select a source of supply who can give fullest dollar value without sacrificing quality or service.

A glance at the chart will tell a big part of the story why so many plastics users select Ideal to fill their requirements. As the largest custom molder in the world, Ideal takes advantage of all the economies which result from large-scale integrated operation, without losing its ability to cope with the problems of each customer on an individual basis. These economies mean tangible savings which are reflected in rock-bottom prices. Yet Ideal's workmanship, as always, is recognized as the finest.

The abundance of Ideal's personnel and facilities—from engineers, draftsmen and moldhands through equipment for diversified molding and finishing jobs—is unequalled in any other molding plant. Consequently, it is a rare molder who is able to deliver finished moldings with the speed or in the volume that Ideal can.

Ideal's dominating position in the injection molding field lends emphasis to the importance of having us estimate on each and every one of your molding jobs. Other than delivery of an order, there can be no more convincing proof of what Ideal, the world's largest custom molder, can do for you. Send your inquiry to A. C. Manovill, Vice President in Charge of Sales. Ideal Plastics Corporation, 184-10 Jamaica Avenue, Hollis 7, New York. Phone: AXtel 7-7000. Mid-West Representative: Steel Mill Products Co., 176 West Adams Street, Chicago 3, Ill. Phone: CEntral 6-5136.

Better Molded Plastics *Ideal* *for Industry & Home*



Erinoid

POLYSTYRENE moulding powders are being manufactured on a large scale by Styrene Products Ltd. in their new air-conditioned plant* at Manchester, England.

This outstanding thermoplastic is available, ready for the moulding machine, in many colours—from water-white to black, from pastel shades to rich, deep tones, from crystal clear to opaque. The powders are untouched by hand and are despatched in specially sealed bags.

**Designed and constructed by Petrocarbon Ltd*

STYRENE PRODUCTS LTD

96 PICCADILLY · LONDON · W1 · ENGLAND

A BRITISH COMPANY FORMED JOINTLY BY PETROCHEMICALS LTD AND ERINOID LTD

Marketing Agents:

ERINOID LTD · STROUD · GLOUCESTERSHIRE · ENGLAND

THE QUAKER OATS COMPANY

Announces

the completion of its NEW QO-Furfural Plant at Omaha, Nebraska

The Quaker Oats Company's Omaha Chemical Plant is now producing the industrially important chemical, QO-Furfural. This chemical is made from raw materials such as corn cobs and oat hulls which are replaceable yearly.

The first QO-Furfural was produced at Cedar Rapids, Iowa 29 years ago. Now this versatile chemical is made not only at Cedar Rapids, but also at Memphis, Tennessee and Omaha, Nebraska.

QO-Furfural is used in refining lubricating oils, gas oil and catalytic recycle stock; extractive distillation of C_4 hydrocarbons; as a chemical intermediate in the production of nylon, furfuryl alcohol, tetrahydrofurfuryl alcohol and other chemical derivatives; as an aldehyde in resin manufacture and as a reactive solvent.

A request on your letterhead will bring you the Bulletin entitled "Current Uses of Furfural."

The Quaker Oats Company CHEMICALS DEPT.

341B THE MERCHANDISE MART
CHICAGO 54, ILLINOIS
EASTERN SALES OFFICE:
ROOM 541B, 120 WALL ST., NEW YORK 5, N. Y.

In San Francisco The Griffin Chemical Company • In the United Kingdom, Imperial Chemical Industries Ltd., Billingham, England • In Australia, Swift & Company, Pty., Ltd., Sydney • In Europe, Quaker Oats-Graanproducten N. V., Rotterdam, The Netherlands; Quaker Oats (France) S. A. 42, Rue Pasquier, Paris 8ᵉ, France In Japan, F. Kanematsu & Company, Ltd., Tokyo

LABORATORY "251"

TECHNICAL DATA

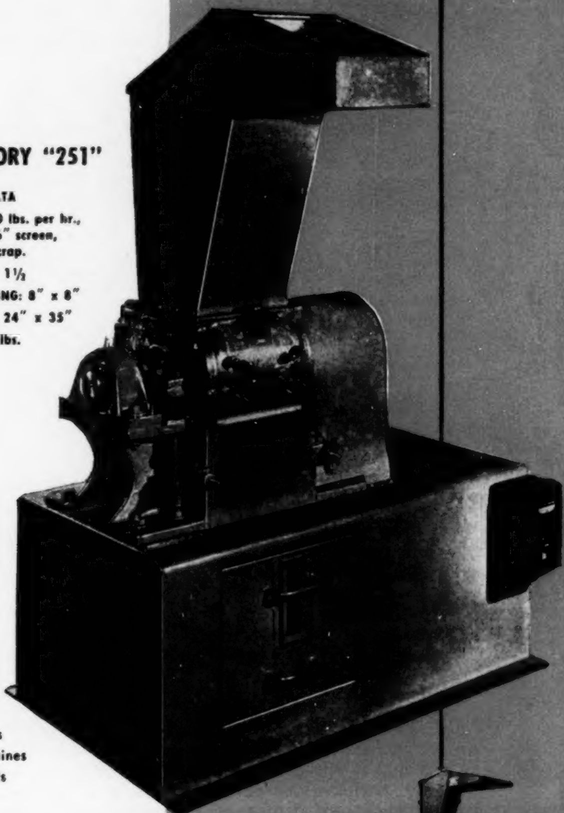
CAPACITY: 150 lbs. per hr., based on 5/16" screen, polystyrene scrap.

HORSEPOWER: 1½

THROAT OPENING: 8" x 8"

FLOOR SPACE: 24" x 35"

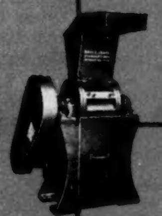
WEIGHT: 650 lbs.



SPECIAL DESIGN ADVANTAGES

- For small plants with varied requirements
- For mounting beside large molding machines
- Engineered to cut large, thin section parts without pre-cutting
- Hopper hinged for rapid opening . . . facilitates cleaning
- New drop-leaf in hopper to prevent material fly-back

Require A Smaller Machine?
B & J Table-Model MIDGET
Handles gates, sprues, etc. from 1/16" to 1/2" sectional thickness, dependent on material, at 20 to 75 lbs. per hr. Throat is 5½" x 6".



Require A Larger Machine?
B & J STANDARD IDEAL
Reduces all plastic compounds up to ½" sectional thickness at up to 200 lbs. per hr. Large 6" x 10" wide throat eliminates feeding troubles and clogged hoppers.

Your grinder source for every individual plastic material cutting requirement and capacity (50 to 3,000 lbs. per hr.)—Ball & Jewell, machine builders since 1865, have always paced the grinding needs of the plastics industry. Send us your requirement specifications.

BALL & JEWELL, INC., 22 FRANKLIN STREET, BROOKLYN 22, NEW YORK

Leadership Through Continuous Engineering Improvements

Tupper Seal, air and liquid tight flexible covers fit, and are included in the sets of all Tupperware Canisters.

The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.

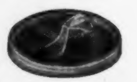
The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.

The Tupper Seal, air and liquid-tight, Pour All cover as a cover for 46 oz. cans; Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.

TUPPER! Seals

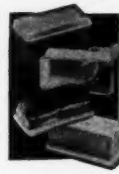
air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.



TUPPER!

There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 2, 5, 8 and 12½ oz. Tumblers too, and these Tupper Seal, covers fit many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Por Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.



The cover of the Tupperware Bread Server which serves as a bread tray also is designed to give similar results as Tupper Seal, air and liquid-tight Flexible covers. Keeps contents fresh as no other such container.

When equipped with Tupper Seal, air and liquid-tight, flexible covers, Tupperware Cereal Bowls serve many another purpose.

The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnels as a base when funnels are used as storage containers.

FORMAL NOTICE! **9th** November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

TUPPER CORPORATION

TUPPER CORPORATION

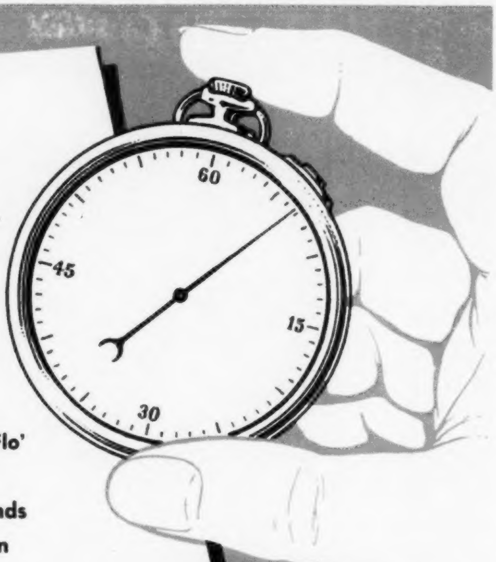
TUPPER

Manufacturers of — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

FACTORIES: Farnumsville, Mass., and Cuero, Texas **New York Show Rooms 225 Fifth Ave.**

ADDRESS ALL COMMUNICATIONS TO: Department B

Seconds Count for $



Even a fraction-of-a-second advantage can mean quoting more profitable prices. F-L exclusive machine design superiority ...rapid advance injection plunger, 'Speed-Flo' heating cylinder, faster warm-up, quick set-up for production runs...mean the seconds saved that make every Fellows machine earn more money for each and every user.

The F-L 1B-3-15

Hottest 3-OUNCE MACHINE ON TODAY'S MARKET!

Since its introduction 2 years ago, this Fellows machine has swept the market like wildfire. It's still setting production records with injection molders from Maine to California. On single-cavity molds, operating at 'Hot Molding' speed, production on the 1B-3-15 is comparable to multiple cavity molds without danger of wasting critical plastic materials.

Today, the Fellows 1B-3-15, tried and proved in use, is far ahead in cycling speed, automatic operation, and overall machine economy. If seconds will pay off in your molding operations, investigate the details now. Call your nearest Fellows office.

For 3-ounce record-breaking performance

1B-3-15

For 8-ounce sustained high capacity

5C-8

Fellows

LEOMINSTER

injection molding equipment

THE FELLOWS GEAR SHAPER CO., Plastics Machine Div., Head Office & Export Dept., Springfield, Vt. Branch Offices: 323 Fisher Bldg., Detroit 2. 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1 • New England Distributor: Leominster Tool Co., Leominster, Mass.

Resists acids!

Withstands alkalies!

Most chemicals can't harm it!

LUCOFLEX
(rigid vinyl plastic)

and

LUCANOL
(vinyl plastic coating)

The hydrofluoric acid used in this "frosting tank" does not react with the tank itself. It is just *one* of the corrosives that has utterly no effect on Lucoflex rigid unplasticized polyvinyl chloride and Lucanol vinyl coatings. Actually, many of the industrial chemicals which are difficult and expensive to handle with ordinary equipment can be easily processed with equipment constructed of these corrosion resistant plastics.

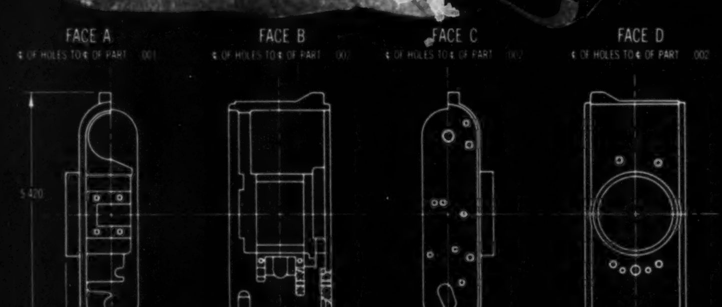
Users of acids, bases, salts, oils, alcohols, chlorine bleach and strong oxidizing agents find Lucoflex and Lucanol suitable for applications in which other materials have been unsatisfactory or only moderately successful. Containers, sinks, hoods, and stills are but a few of the items which have been made chemically resistant.

Their physical and thermal properties are similarly outstanding. The softening point is high—170°F. And Lucoflex can be formed into compound curves by conventional methods.

Lucoflex can be calendered, extruded, transfer molded and fabricated. It comes as sheets, rods, tubes and molding compound. Lucanol can be brushed or sprayed on. Further data will be sent on request. American Lucoflex, Inc., 1 East 57th Street, New York 22, N. Y.

"Frosting tank" fabricated entirely of chemically resistant Lucoflex. Made for Blue Ridge Glass Corp., Kingsport, Tenn.

Snapshot of a Profitable Operation



PART: Plastic Camera Case

PRODUCTION: 250 parts per hour for the battery of NATCO A-33 Light Sensitive Multi-Drillers

OPERATIONS:

FACE A—Drill four holes to .070" diameter

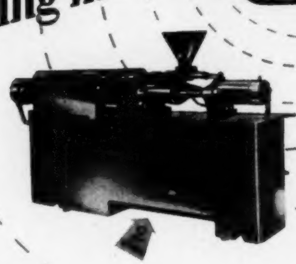
FACE B—Drill two holes to .067" diameter and one hole to .0781" diameter

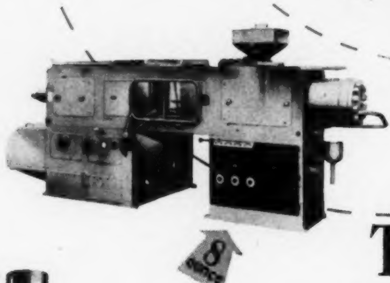
FACE C—Drill six holes to .0781" diameter, three holes to .089" diameter, one hole to .120" diameter, one hole to .082" diameter and one hole to .281" diameter

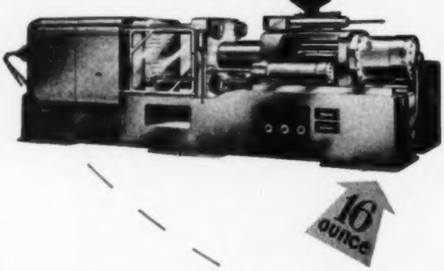
FACE D—Drill two holes to .070" diameter, two holes to .1465" diameter, two holes to .0781" diameter and one hole to .191" diameter

focus on injection moulding machines

PECO
PROJECTILE PRODUCTS







THE attention of Plastics manufacturers may profitably be centred on PECO Injection Moulding Machines, for they are designed to give high productivity through maximum efficiency.

They are built in 2oz., 4oz., 8oz. and 16oz. capacities. They represent the most up-to-date development of this type of plant.

Full particulars will be sent on request.

MOULDS

PECO MOULDS. Expert designers and mould makers are employed and moulds can be supplied to samples submitted, including die-sinking models if desired. An important side of the Company's work is the hobbing of cavities for moulds and medallions—the plant includes a 3,000-ton Hobbing plant. Master Hobs to customers' samples made as required.

THE PROJECTILE & ENGINEERING COMPANY LTD.

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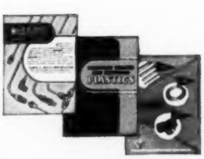

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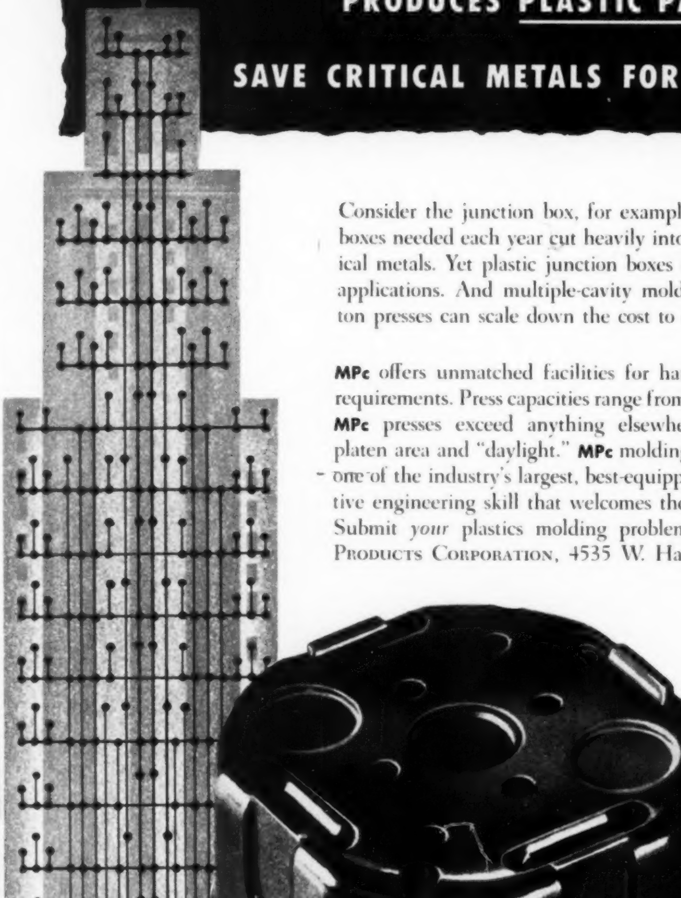

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—and Emery Plastolein Plasticizers give your plastics outstanding durability and wear-resistance

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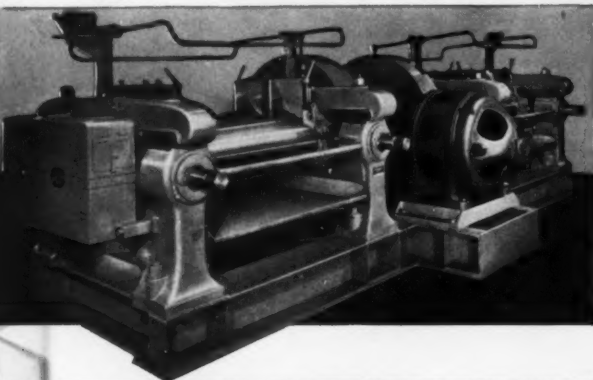

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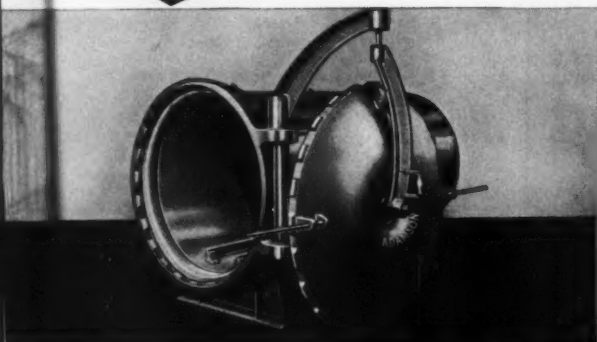
22" & 22" x 60" Mills designed and built for mixing and plasticizing an internationally known plastic material. The rolls operate in anti-friction bearings and the two Mills, together with right angle drive and motor, located between the units, are mounted on a continuous one-piece bedplate.



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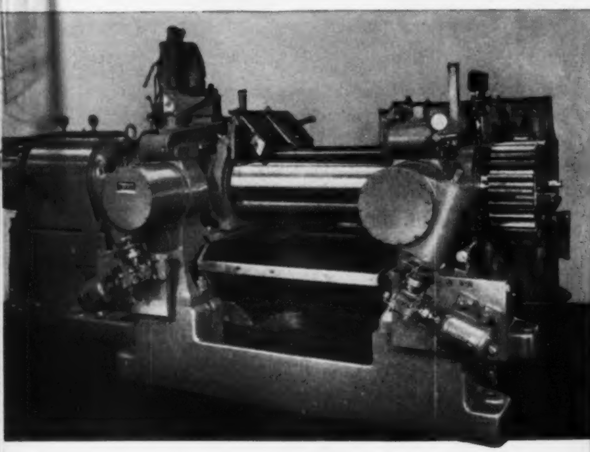
Built in sizes ranging from 18 inches to 15 feet in diameter and any length, vertical or horizontal. Illustration shows a horizontal type with hinged, quick-opening door. Vulcanizers can be built to withstand internal pressures up to 1000 pounds per square inch. Write for our special bulletin .



MIXING MILLS

These are built in all sizes from 6" x 16" to 28" x 84". The one illustrated is a late model (shown without gear enclosure), designed for plastics. It has rolls 20" in diameter by 48" long on the working face; flood lubricated roll boxes; tilting stock guides; motor-operated adjusting screws; stainless steel stock pan; dial indicators for front roll position; two sets of connecting gears for operating rolls at two different friction ratios, and an individual motor drive, with geared head and flexible coupling direct-connected to rear roll.

We can supply any size Mill driven individually; in pairs with right angle reducer between the units; or grouped on a line shaft with reducer at one end of the shaft.

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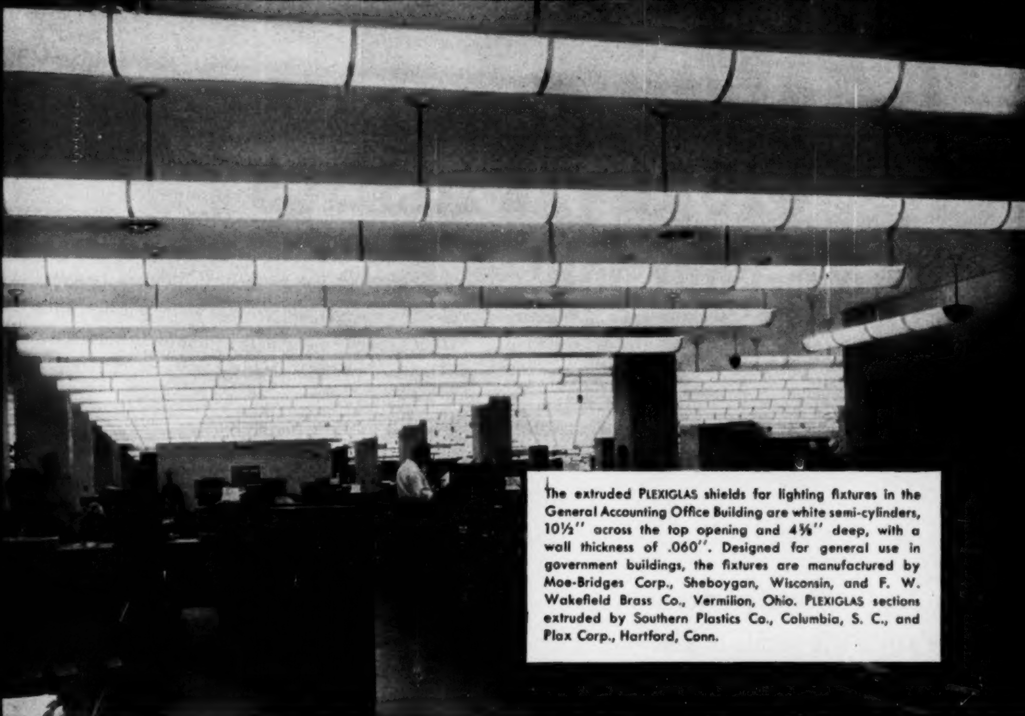

The extruded PLEXIGLAS shields for lighting fixtures in the General Accounting Office Building are white semi-cylinders, 10½" across the top opening and 4⅜" deep, with a wall thickness of .060". Designed for general use in government buildings, the fixtures are manufactured by Moe-Bridges Corp., Sheboygan, Wisconsin, and F. W. Wakefield Brass Co., Vermilion, Ohio. PLEXIGLAS sections extruded by Southern Plastics Co., Columbia, S. C., and Plax Corp., Hartford, Conn.

25 Miles of EXTRUDED PLEXIGLAS

At the new General Accounting Office Building in Washington, twenty-five miles of PLEXIGLAS acrylic plastic shields are used to reflect and transmit light from nearly thirty-three thousand fluorescent fixtures. Extrusion-grade PLEXIGLAS made possible the most economical production of shields that would meet the rigid requirements of the application—dimensional stability, resistance to discoloration and breakage, and control of the transmittance-reflectance ratio.

For *your* large volume applications requiring extruded parts, consider PLEXIGLAS. Extrusion-grade PLEXIGLAS molding powders are being used for a wide variety of shapes—curved panels, tubes, rods, and flat and corrugated sheets. Such sections have the familiar PLEXIGLAS properties of light weight, durability, dimensional and color stability, and resistance to age and weather.

For information on clear and colored PLEXIGLAS powders for injection and extrusion molding, write for our technical bulletins. We'll be glad to send you full details.

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every facility for every operation gives you Custom Injection Molded plastic parts ready for your assembly

Erie Resistor is prepared to mold any plastic part, from the smallest to the largest. It is also prepared to perform any supplementary operations which are needed to complete the piece in every final detail.

It requires more than 10 operations to produce the finished beauty of this Zenith escutcheon plate; operations such as injection molding, foiling gold and black, drilling holes, spray-painting in black, green and gold, filling and wiping in white, destaticising, etc., and after careful final inspection, packaging in a protective polyethylene bag and individually cartoned for shipping.

The fact that Erie Resistor has all of these facilities for finishing molded parts means economy for you in your final assembly. Write for our new bulletin: "Who We Are and What We Do in Plastics."

The escutcheon plate for the handsome Zenith H-500 Trans-Oceanic Portable Radio was molded and decorated by Erie Resistor.

Plastics Division

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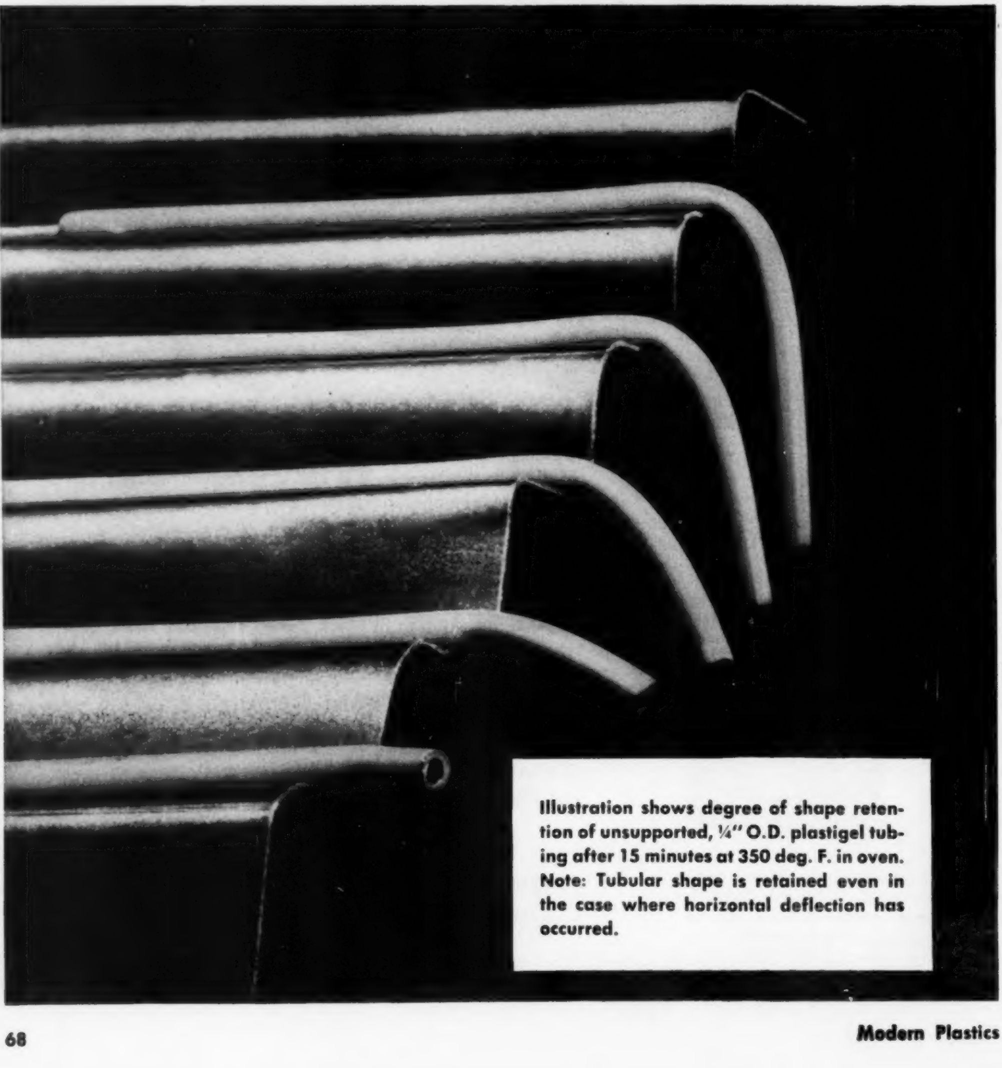
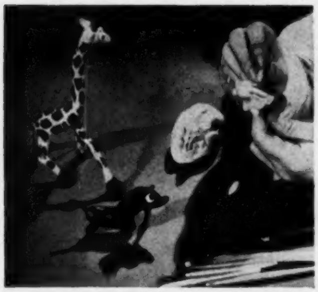


Illustration shows degree of shape retention of unsupported, ¼" O.D. plastigel tubing after 15 minutes at 350 deg. F. in oven. Note: Tubular shape is retained even in the case where horizontal deflection has occurred.

Now a new formulation based on VINYLITE Brand Dispersion Resins offers you countless opportunities for production of plastic accessories, flooring, toys, fittings ... hundreds of new products ... with simpler techniques and lower costs!

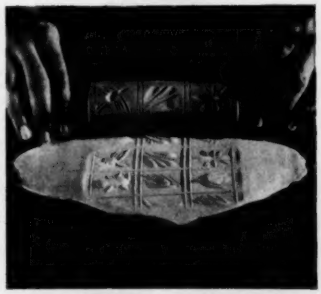
A modification of plastisol formulae, plastigel of VINYLITE Resin prior to heat treatment resembles putty in consistency. Relatively stiff, it can be quickly softened at room temperature by stirring or kneading, and formed by hand pressure, molds, or dies into complicated shapes and fine details. After forming, it gradually stiffens again, becoming self-supporting. It bakes to a hard, finished state in fifteen minutes at only 350 deg. F., with minimum support without sagging, shrinking or otherwise losing its shape.

VINYLITE Resin plastigel can be pigmented to any color. Simple techniques permit similar formulae to be used for a spray or dip-coating. Its properties can be adjusted to match those of familiar VINYLITE Plastics in strength, flexibility, and appearance. Costs compare favorably. Consult your present supplier of VINYLITE Resin Plastisols, or write Dept. LP-7.



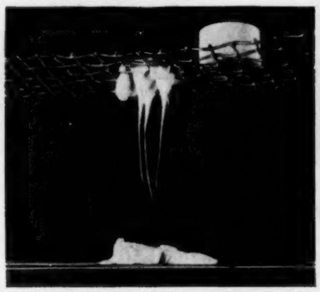
Easily modeled—at room temperature—new VINYLITE Resin plastigel can be worked by hand, begins to stiffen when at rest, retaining shape, dimension and detail even while fluxing. The use of supports is required only for heavy sections.

Continuous extrusion at room temperature of new VINYLITE Resin plastigel. Flows so easily, even hand pressure readily forms plastigel into ribbon, rod or tube. May be fused in same operation by passing through hot CARBOWAX bath at 350 deg. F.



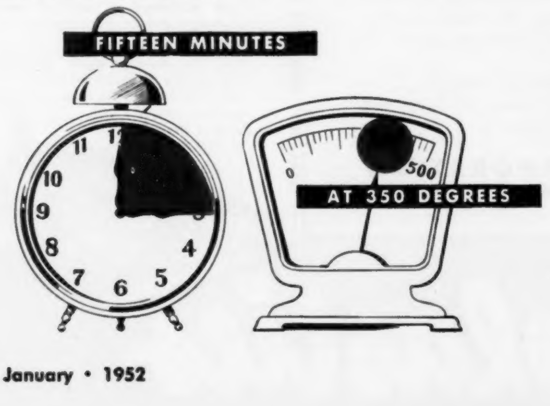
Low-pressure heatless embossing shown by use of intaglio rolling pin. VINYLITE Resin plastigel also calenders readily, picks up and holds fine details, retaining them during subsequent fusing process. After fusing, this sheet will be tough, flexible, wear-resistant.

Quick-stamping operations are easy with VINYLITE Resin plastigel. Low pressure reduces die and equipment costs. Trimmings can be reworked. One mold serves for unlimited impressions because plastigel can be removed immediately for baking.



Shape retention under heat is illustrated by this wire screen holding VINYLITE Resin plastigel pictured from below. Plastigel won't melt or sag. Standard plastisol, at left, softens and runs through mesh when subjected to heat.

Dip-coating operations are easy, too, with VINYLITE Resin plastigel formulations. Readily colored plastigel, right, also permits greater thickness of coating in one application. Follows details closely, sticks fast, giving object a tough, continuous protective film.



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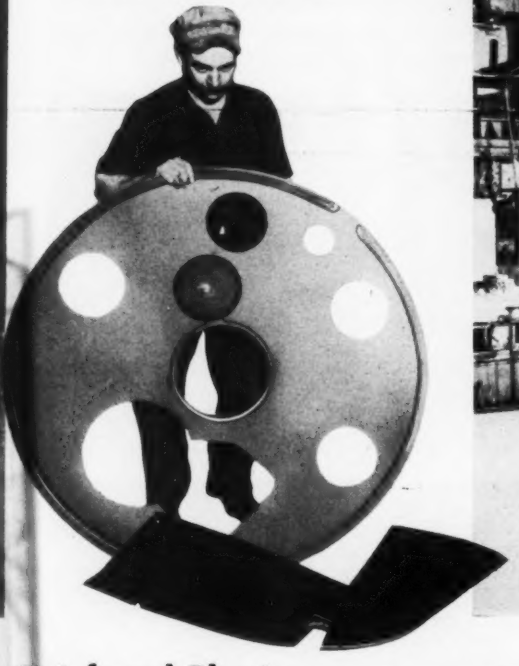

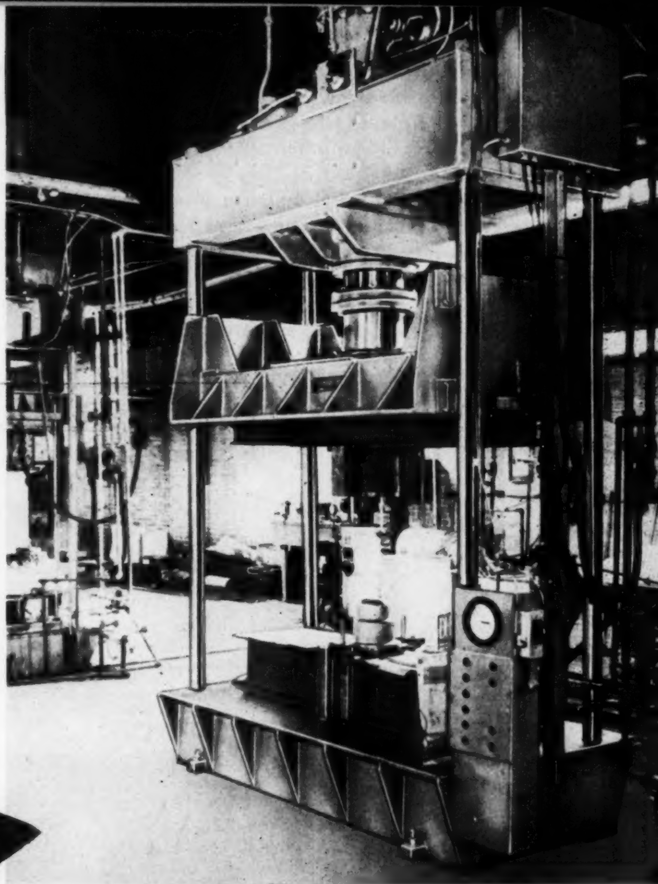

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In the molding of reinforced plastics; resins, reinforcements and catalysts are mixed in many different combinations to obtain a wide latitude of physical properties.

Compared on a strength to weight basis, reinforced plastics are superior to steel. Because of this exceptional strength, reinforced plastics are being widely used for aircraft parts, radomes, motor housings, structural members, etc. Low mold costs and relatively short tooling time make it practical to produce short runs as well as production quantities.

Consider reinforced plastics to relieve your material shortage . . . or provide better physical properties to improve your product. An Aico engineer will be glad to discuss your needs. Drop us a line today.

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MOLD BUILDING to avoid division of responsibility.

INJECTION MOLDING for high rate of production . . . low unit cost.

COMPRESSION MOLDING of large parts with heavy cross sections.

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REINFORCED PLASTICS . . . a relatively new development in low pressure molding of reinforced resins . . . especially suitable for large moldings requiring special physical properties.

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A SPECIAL SERVICE TO MODERN PLASTICS READERS, REPORTING AND INTERPRETING THE LATEST NEWS AND DEVELOPMENTS FROM WASHINGTON AND ELSEWHERE AS THEY AFFECT THE PLASTICS INDUSTRY AND THE MOBILIZATION PROGRAM

Modern Plastics BULLETIN

December 19, 1951

Where To In the Next Six Months?

Any man would indeed be rash to pretend to predict accurately what will happen to business in the next six months. This department lays no claim to clairvoyance. We can only assemble and publish information given us by the best informed sources that can be found. At this writing those sources give hazy and conflicting reports. The best analysis we can make is that business for the next three months will be fair, but tough to get. It won't be coming in over the transom; digging will be necessary to get it. Perhaps the second quarter of the year 1952 will bring easier going to all industry.

Insofar as plastics are concerned, nearly all the raw material pipe lines are full. But the processors' bins as well as the shelves of their customers are also full. In other words, the raw material producers, the processors of raw material, and their customers are well stocked. If the ultimate consumer will buy, business should be good. On the other hand, metal shortages which require cutbacks of hard goods that also use plastics (autos, television sets, refrigerators, washers) will seriously affect the over-all volume of production of plastics parts.

Defense Production Moves Slowly

The lagging progress in production for the Defense Program is a worrysome feature. This program was supposed to take up the slack, but so far has moved slowly. The spending rate for defense tells the story. In the fiscal year July 1950 through June 1951 the Government obligated \$35 billion for equipment, construction, and expansion of industrial facilities. But only \$11 billion worth of those goods has been delivered—the balance won't be delivered until 1952 or '53. The comparable obligated spending figure for fiscal 1952, which started July 1, 1951, is \$48.4 billion, but actual deliveries which mean cash in the till will be spread from six months to two years in the future.

Today's delivery schedule of defense goods is about \$2 billion a month. It is *hoped* that it will rise to \$4 billion by June, 1952. Much depends on how fast operations can be accelerated.

Many persons think that this defense spending will make up for the curtailment of civilian goods production. But, after all, it isn't such a big figure when compared to the country's entire industrial capacity of \$300 billion. Take men's socks as an example. Say the defense force is 3 million men. Give them 12 pairs each. That is 36 million pairs, and that number could be supplied in a month if the business were divided among all producers. It seems, therefore, that business must still depend heavily upon the civilian populace to do a lot of buying. Optimists point out that more people are working than ever; that scads of savings are in the bank; that no government administration will permit a business lull in an election year. So—figure it out for yourself!

The one thing in particular that bothers us is that, except for plastics used in airplanes (only a few thousand have been made so far), we can't find much plastics accounted for in those obligated government funds. Perhaps they will show up when defense production speeds up, just as they did in 1943. In the meantime, the plastics industry must depend on civilian business to keep going.

Price Control Calendar

A general review of the pricing regulations established by the Office of Price Stabilization is pertinent at this time since the passage of Amendment 33 to CPR-22, which makes CPR-22 mandatory for many members of the plastics industry on December 19, 1951. We are presenting below a sort of extended glossary which it is hoped will be helpful in defining certain aspects of the pricing regulations as they are applied to plastics.

General Ceiling Price Regulation (GCPR) was the original freeze order which forbade the raising of any price (there were a few specified exceptions) beyond that charged during the period December 19, 1950 to January 24, 1951.

Ceiling Price Regulation 22 (CPR-22), issued April 25, 1951, gave firms a chance to adjust their prices which had been frozen under GCPR, but permitted only those increases which could be attributed to wage and material costs. Until recently, no one was required to come in under CPR-22 unless he wished, but when he made CPR-22 effective after submitting Form 8, the regulation became applicable to every product in the producer's line. In other words, the regulation couldn't be used to raise the price on any one item. In most cases, it meant that there were roll-backs on some items and roll-ups on others within product lines of the affected company.

Supplementary Regulation 12 (SR-12) to CPR-22 listed various products that were exempt from CPR-22 until special regulations were written because conditions were such that they could not be properly handled under CPR-22. Custom molded items were included in this group.

Form 8 Must Be Filed

Amendment 33 to CPR-22 practically forbids the sale of any goods after December 19 unless the manufacturer has filed his Form 8 which would place him under CPR-22. In most cases, this amendment eliminates GCPR, except where there are supplementary regulations under SR-12, such as SR-14 which controls custom molded and fabricated products. Proprietary molded products are included under Amendment 33. The original regulation (CPR-22) permitted price changes from the GCPR regulation so that a manufacturer could increase his prices from the pre-Korea level by his labor and material cost adjustment factors as computed under CPR-22. But he couldn't allow for wage increases after March 15, 1951, nor material increases after December 31, 1950. SR-17 extends that cut-off date to July 26, 1951, and also allows for increases that have taken place in "factory, selling, advertising, office and all other production, distribution, transportation and administration costs."

SR-17 is the regulation embodying the Capehart Amendment under which any manufacturer may apply for price adjustment at any time, but his application will be subject to review and he has to meet all the requirements of CPR-22 first by filing Form 8 which he was supposed to have done by December 19. So far as we know, no one has yet filed for price adjustments under SR-17. In the first place, it means oodles and oodles more rigamarole to contend with in the matter of additional forms to fill out, and there is a belief that it will be of no help anyhow. It relates the sales and production of the first half of 1951 to the first half of 1950 so that if production in the first half of 1951 was greater than in the same period in 1950, a minus factor would creep into the price adjustment. That circumstance occurs because the regulation was based on the theory that increased production means decreased overhead. In the plastics industry it so happens that production was generally much higher in the first half of 1951 than in the same period of 1950. Consequently, most people won't touch SR-17 for the time being at least.

Custom Made Products

Supplementary Regulation 14 (SR-14) to CPR-22 is the specially tailored regulation for custom molded products and custom fabricated products. The latter are defined as those fabricated from plastic sheets, rods, tubes, and laminates made to one customer's specifications and sold only to that customer. Under Amendment 4 to SR-12 to CPR-22, *the effective date of CPR-22 has been indefinitely extended for custom and custom fabricated products.* This means that such products may remain under GCPR until the new revision to SR-14 is issued, when an effective date will be named—probably six weeks from issue date. When that date becomes effective, it will be illegal to sell any custom molded or fabricated piece unless the processor has complied with the terms of SR-14 and CPR-22. It should be reiterated that a custom molder and fabricator must still file his Form 8 when he changes over from GCPR to CPR-22. SR-14 covers only those products not manufactured or offered for sale in the period July 1, 1949, to June 24, 1950, but the bulk of the custom business is, of course, new products.

One of the biggest problems underlying all these regulations are the cut-off dates in CPR-22 and SR-17. Some manufacturers of raw materials and molding compounds have increased their prices since July 26, 1951. Under the regulation that is now written, the molder or fabricator is required to absorb these prices. He cannot pass them on.

Any questions? Then write to Robert Bell, Consumer Goods Division, Office of Price Stabilization, Room 2117, Tempo Building S, Washington, D. C.

Polyethylene

The breakdown of polyethylene distribution for December was about like this: military, 32%; essential civilian, 36.4%; turned back to distributor for "free" distribution as he saw fit, 31.6 percent. Note that the so-called "free" distribution was up 7.6% from November. This means considerable to processors who are depending on the "free" material for their supply line, since production is now quite a bit higher than it was a month or two ago.

The allocated material was divided about as follows: military, as noted above, 32%; packaging, 12%; non-packaging (mostly wire coating), 20.3%; miscellaneous, 1.1%; closures, 1.8 percent. Of the material left for "free" distribution, 1% or so was channeled into small orders of 500 lb. per customer. It has been estimated roughly that somewhere between 40 and 45% of all polyethylene production and ½ to ⅔ of

the "free" material has been going into packaging, including bottles, over the last few months.

There has been a great deal of loose talk about polyethylene becoming free and easy before the first quarter of 1952 is over. Any such talk should be taken with a grain of salt. It is true that polyethylene production has been increased considerably since September 1951. Up until that time, it has been estimated that production was running from $4\frac{1}{2}$ to 5 million lb. a month. Capacity now may be 6 or 7 million lb. a month. It is natural, then, that customers should be getting more polyethylene now than they did a few months ago. As a result, some of them spread the report that polyethylene is easy. There is still a heavy demand which will be emphasized about next February or March when one of the producers plans to curtail production in order to make some changes. But along in April or May there will be another fair sized increment coming in so that by the second quarter of this year, all customers now using polyethylene will probably be able to get more, but how much more is still a question.

Rise and Decline of Military Orders

The military "take" on a percentage basis has dropped steadily for several months, but that is due to the fact that more polyethylene has been produced and to a decline in orders for polyethylene coated assault wire. However, military orders are due to pick up again within a few months' time, not only for the assault wire, but for many other uses, such as packaging for batteries and spare parts. Polyethylene film producers are also urging that the Quartermaster Corps forget its efforts to wrap supplies in other plastics than polyethylene whenever it is found that polyethylene will do the best job.

There is, of course, widespread interest in how much of today's demand for polyethylene is inflated. Practically everyone admits that customers for polyethylene film are placing orders for the same job with several producers, but no one can tell just how much this duplication amounts to. Leading producers of film insist that a large portion of this so-called inflated business is backed by real demand. For example, it can be shown that even today, when polyethylene film is supposed to be allocated primarily for frozen foods, great quantities of it are being used for such things as candy bags, garment bags, and similar applications.

Polyethylene for Soft Goods?

Other processors assert that there is an almost completely unsatisfied demand for such things as low cost raincoats, bowl covers, drapes, table covers, and so forth. They feel that the big uses for polyethylene up to now, such as wire coating, bottles, frozen foods, and general packaging, will continue to get bigger, but that this soft goods market is only in its beginning phase. Then, too, there is the polyethylene coated paper field which is an outlet that was just getting big when allocation came along. There are probably only three or four firms engaged in this enterprise in a big way, but there must be at least twelve to fifteen who have put in big extruders and are all set to go into this one application just as soon as more polyethylene becomes available.

When all these factors are put together, it seems dangerous to predict that there will be plenty of polyethylene in the next six months. One thing is certain—the government has given no indication that it has any intention of taking polyethylene off allocation in the near future.

Plastic Suits for Soldiers

A great hullabaloo was raised in the newspapers a couple of weeks ago concerning a demonstration of plastic flotation suits for soldiers. The affair was staged in a lagoon in front of the Pentagon Building in Washington, D.C.

The suit was worn under a soldier's regular outer garments, and consisted of a single undergarment which covered the whole body. According to the reports, the synthetic material fits closely around the body, and, while smooth on the outside, is held away from contact with large areas of the body by hundreds of tiny cushions. This permits air to circulate beneath the garment and, because the wrists and trouser legs are free, encourages circulation through what the Army calls the flume, or chimney, principle.

In the demonstration at the Pentagon, soldiers wearing the suits, and equipped with helmets and 26-lb. packs, jumped into the water, and then floated easily about for 20 minutes. Although the water was a chilly 45°, they emerged warm and happy. The idea was to show that the plastic suit would help retain the body heat and thus keep the men warm in cold weather.

The material used in the undergarments is called a plastic sponge. The material is Ensolite, which was used in a similar manner for a vest described in MODERN PLASTICS, August, 1951. Other modifications are used in mats for prize fight arenas and in other applications. Ensolite, manufactured by U.S. Rubber Co., is a cellular sponge vinyl.

The plastic suit demonstrated is said to be highly experimental and far from ready for adoption or approval by the Armed Forces.

Rubber and Styrene in 1952

How will polystyrene fare in 1952? All the seers are predicting that there will be considerably more than in 1951, provided the customers continue their present demand—but a lot depends on *how much more* those customers are going to want. There are still

so many facets to the styrene program that it is impossible to draw a clear picture of what will happen if demand should continue to increase in all the various outlets to which monomer is flowing.

A rough review shows that sales of polystyrene were about 15 million lb. less in 1951 than in 1950 because there wasn't enough material to supply demand in the first half of the year. The ratio of decline for high-styrene-butadiene resins was much more precipitous but, on the other hand, there was a big increase in styrene latices. It seems apparent from the statistics that producers of monomer who also produce polymer and latices prefer to channel their monomer into their own products rather than sell it for high-styrene resins and other purposes. The demand for monomer to use in ion exchange and polyester resins was only a few million pounds. What the increased defense production planned for 1952 or an all-out war would do to this pattern of distribution is problematical. Polyester resins for reinforced plastics would go up—so would high styrene-butadiene for shoe soles. Possibly the latices for coatings would increase. Polystyrene might decline if monomer became scarce. Much would depend on whether or not steel had become available with which to build new facilities for monomer and upon a continuance of the 60 million gal. import stream of benzene from Europe. Capacity for monomer is now well over 700 million pounds. It may reach 880 million by the end of 1952.

More Polystyrene Assured

Now that these ifs, ands, and buts are taken care of, the prediction can be ventured that under our present economic pattern, some 300 million lb. of polystyrene and copolymers may be molded in 1952.

The chief reason for this optimism stems back to rubber—the villain that held back polystyrene in 1950 and 1951. The rubber situation is now so good that the Government is planning to remove restrictions early in 1952. Less will be needed for new cars and trucks since fewer will be built. The natural rubber stockpile is, or soon will be, sufficient for an emergency. The situation in Southeast Asia, from where the rubber comes, looks worse from day to day, but that high price of 52¢ a lb. seems to be sufficient enough to make men risk their lives every day to get out the rubber. But when the United States stops buying that total of 30 to 70 thousand tons a month, much of which is stockpiled, the price will probably drop and rubber manufacturers in this country will start using larger percentages of natural. If we don't buy natural rubber, the State Dept. will howl and say we are ruining the economy of Southeast Asia and making it susceptible to Commies. There will probably be less rubber imported, but there will still be large quantities nevertheless. Then the demand for GR-S will decline, especially if the natural rubber price declines very much. The rubber people disagree with this and point to the ever-increasing new uses for rubber. But those new uses take time for full scale development.

Alcoholic Rubber Might Be Curtailed

Then there is another possibility. A good portion of the present GR-S is costing the taxpayer some extra dough because part of the butadiene made today comes from high cost alcohol in comparison to low cost petroleum. So if natural rubber becomes more available, it is possible that the alcohol type butadiene plants could be shut down, thus making available for other purposes the styrene used with that particular butadiene.

GR-S Production to Increase

Regardless of these things, the Government is moving ahead with its program to raise the GR-S production from 760 to 860 thousand long tons a year, but it has been delayed by various factors. Two butadiene plants burned down during the year and, although that left more styrene for plastics, it was tough on rubber. However, the new program is now started and will be on full schedule next July if everything goes well. The rubber program consumed 329 million lb. of styrene in 1951—isn't likely to consume more than 380 million in 1952 even though the 860 thousand ton rubber schedule rate is met in July. It is also interesting to note that the use of 20% of styrene in GR-S rubber is now applicable to 75% of all such rubber made and is especially applicable to cold rubber which is also increasing in percentage of the total. Just two years ago it was thought necessary to use 23½% styrene.

From the above figures it can be seen that probably over 400 million lb. of styrene will be available for plastics in 1952. We would say that if you have been holding off on a big mold because of a feared styrene shortage, you can take a chance and hop to it.

Phenolic Plywood

Some of the plywood manufacturers insist that we were too optimistic last month in painting such a rosy picture of the plywood industry for the last quarter of this year. Unfortunately, our report was written just about the same week when a rather heavy decline did set in which decreased production about ⅓ in November and was caused largely by the delay in the military program, a decline in housing, and over-production of the interior grade of softwood plywood. From all that we can find out, the decline was much more evident in interior grade than in the exterior grade which uses phenolic resin—the product with which we were most concerned. It now seems probable that the fourth quarter use of phenolic resin for exterior grade plywood will be somewhere near 20% less than the third quarter, which ran about 3.8 million lb. of solid resin per month. October use was above September, but not quite equal to the August figure.

NEWS AND VIEWS OF PLASTICS PROGRESS

STOKES plastics review

VOL. 1

NO. 1

1952

PUBLISHED BY F. J. STOKES MACHINE COMPANY, PHILADELPHIA 20, PA.

New Extruder also Compounds, Colors, Pelletizes

Now on demonstration at the Stokes plant is the RC-100 model of the new line of Stokes Extruders.

The new Stokes-Windsor Extruders form tubes, tapes, sheets, belting, channels, molding, piping and other sections in continuous length. Sheet up to 54 inches wide, thickness as low as 8 mils (3 mils by inflation process), thick-wall tube to 1-inch gage indicate the scope of this remarkable new equipment. In addition, the Stokes-Windsor Extruders compound, color and pelletize for injection molding and re-extrusion.

The unique mechanical feature is the multiple screws which deliver positive and constant pressure on the plastic material. There is a complete absence of pulsation . . . therefore uniform thickness and close tolerances are assured.

Three models are available: the RC-65, twin-screw, capacity 65 pounds per hour; the RC-100, twin-screw, capacity 100 pounds per hour; and the RC-200, triple-screw, capacity 200 pounds per hour.

Send for your copy of literature on the new Stokes-Windsor Extruders.

View of Stokes-Windsor twin-screw Model RC-100, making rigid polyvinyl chloride tubing in the Stokes plastics laboratory

Today's Economies Often Depend on Automatic Operation

Many manufacturers who have profitably used semi-automatic or manually operated presses, perhaps for years past, may wisely review current needs with an eye to the startling economies of fully automatic molding. For those products to which it is applicable—and there are many—it reduces labor cost per unit of production to practically nothing.

Stokes brochure, "Fully Automatic Molding of Thermosetting Plastics", gives a brief history of the development of automatic molding, a clear analysis of considerations, and many examples of pieces which are automatically molded at minimum cost. It's not just theory . . . the case-histories show names, products and savings. Send for a copy.

STOKES

A New Transfer Molding Press

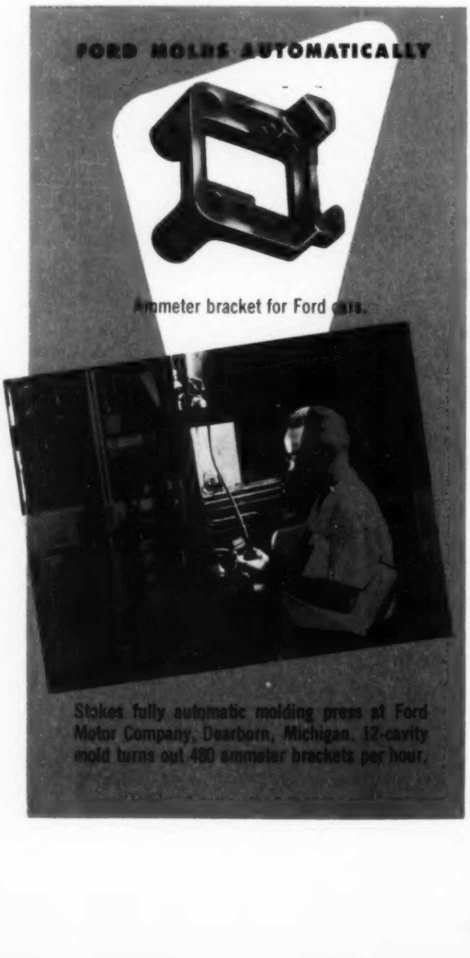
Stokes Model 727 is a straight-ram hydraulic transfer press. The 100-ton model has a 12″ stroke and a die area of 24″ x 20″; the 200-ton model a 15″ stroke and a die area of 30″ x 24″.

Model 727 may be equipped for either top or bottom plunger work. Both main and transfer rams have individual pumps and controls for maximum flexibility.

All phases of the molding cycle are automatically controlled by the exclusive Stokes Bar Controller. This provides split-second timing of both clamping and transfer rams, and speeds the molding cycle.

The exceptionally long transfer ram stroke allows complete withdrawal of the plunger from the loading area to give generous clearance for loading preforms. Send for Bulletin No. 511.

Stokes Model 727 200-ton transfer molding press.



Ammeter bracket for Ford cars.

Stokes fully automatic molding press at Ford Motor Company, Dearborn, Michigan. 12-cavity mold turns out 480 ammeter brackets per hour.

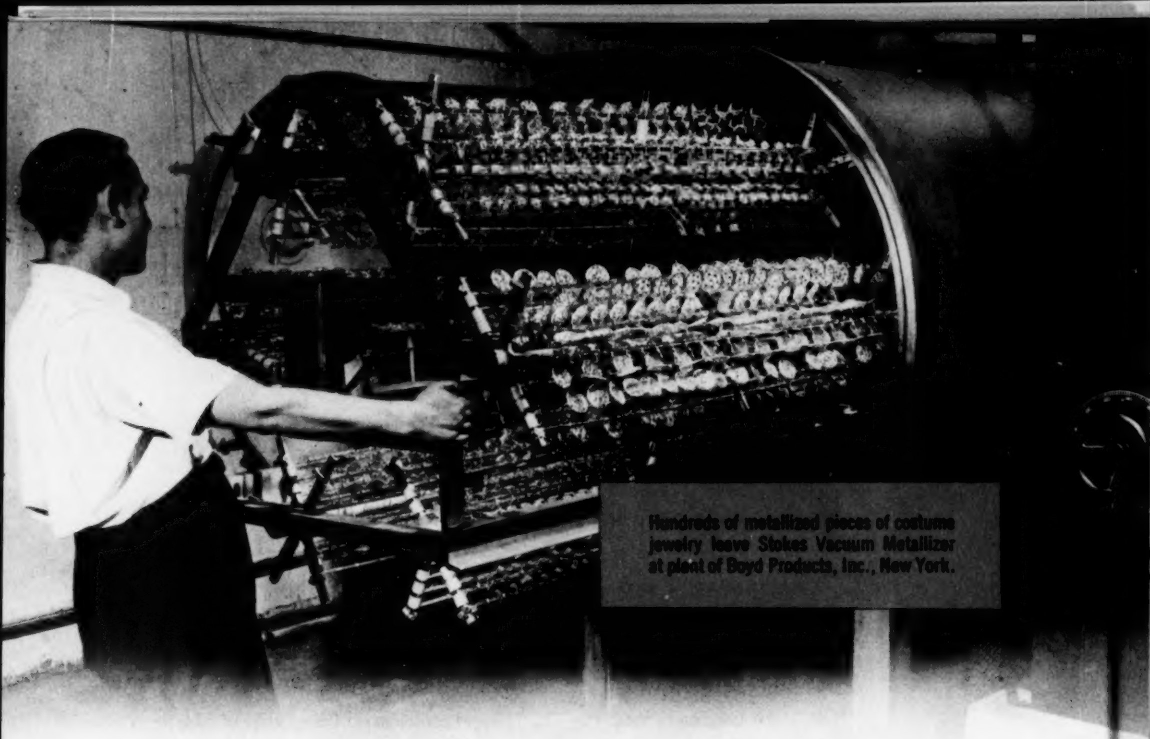
Voco Saves 60% on Processing Materials for Kiddie Records

The fast-growing market for children's records brought Voco, Incorporated, of Brooklyn to the point of determining the minimum cost at which pure "Vinylite" records could be made. Plastic preforms looked like the answer and indeed they were. Stokes preform presses, installed over a year ago, "effected a 60% saving in the cost of processing raw materials," according to George N. Fishman, president of the company.

Stokes Advisory Committee and the Bakelite Development Group worked with Mr. Fishman on a development program which led to this remarkable economy in processing.

Stokes has a handsome brochure on Plastics Preforming . . . send for your copy.

One of two Stokes Preforming presses making preforms for pure "Vinylite" Kiddie Records.



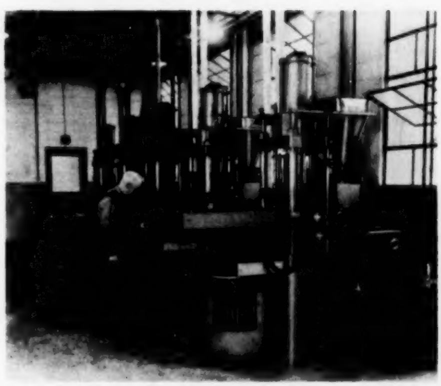
Hundreds of metallized pieces of costume jewelry leave Stokes Vacuum Metallizer at plant of Boyd Products, Inc., New York.

Low Cost "Metal" Parts Now Made of Plastics

Costume jewelry, for example, can be plastic molded, then vacuum metallized to look like gold, silver, or what-you-will. The appearance is brilliant, the cost low, the color range complete. Vacuum Metallizing takes so little metal that 11 ounces would cover a football field. Stokes offers complete equipment and assistance to manufacturers studying this profitable new field of operation. Send for a handsome descriptive brochure (with vacuum metallized covers).

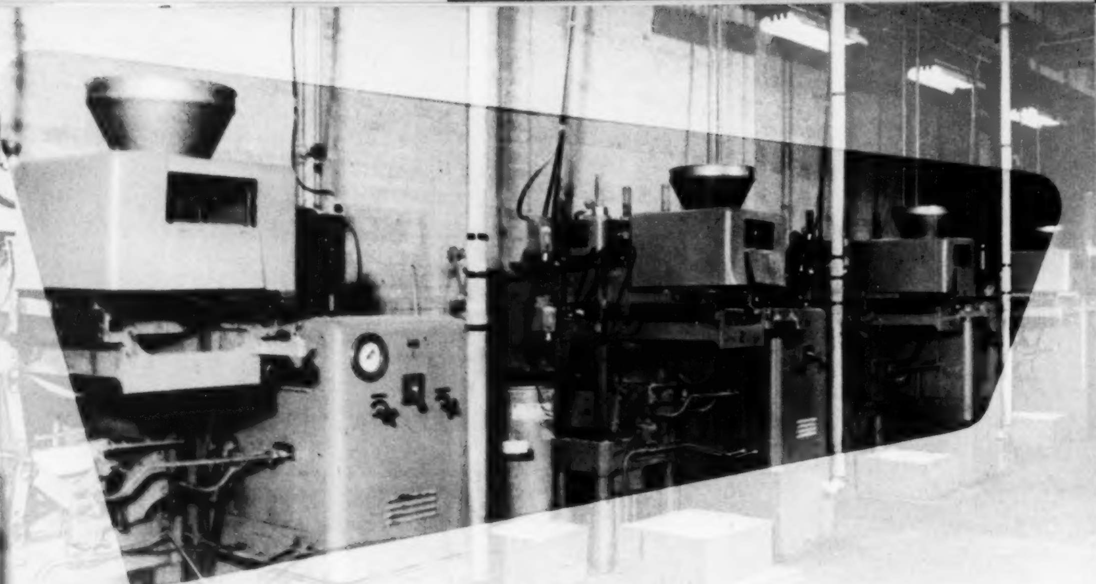
6000 Nursing Bottles per Hour Twenty-four Hours per Day!

Hard to imagine the country needs so many! Yet this is the production of only one manufacturer, Pyramid Rubber Company of Ravenna, Ohio; largest in the field. The two plastic parts for each Evenflo Nurser are made at the rate of 12,000 per hour by Harcort Manufacturing Company, also of Ravenna, on 13 Stokes fully automatic molding presses tended by *two men!* Harcort's production men report Stokes Presses have operated perfectly from the first day.



Model 741 Stokes fully automatic presses making sealing discs for Evenflo Nursers.

STOKES



One Man to a Battery of These Automatic Closure Presses

Sun Tube Co., of Hillside, N. J., makes hundreds of thousands of plastic collapsible tubes and bottle-caps for the famous Bristol Myers products and many others. Four Stokes Model 252-A, 50-ton fully automatic closure presses turn out as many as a half-million caps per 24-hour day and have been giving highly satisfactory service since the operation started two years ago.

How to Cut Cost of Preforming

Have you received your copy?

One way is to keep punch and die costs down. And the way to do that is to get a copy of a new brochure called "How to Save Money on Punches and Dies". Simple detailed instructions tell everything that Stokes' punch and die men know about the care and feeding of punches. The newest apprentice who has occasion to handle a punch or die can guard himself against errors; the oldest hand can probably learn a trick or two. If he doesn't, he will at least be sure that he knows as much as anyone else in the business.

Copies of "How to Save Money on Punches and Dies" available on request . . . just tell us how many you need.

STOKES

F. J. STOKES MACHINE COMPANY
5934 TABOR ROAD, PHILADELPHIA 20, PA.

STOKES MAKES Plastics Molding Presses / Industrial Tabletting and Powder Metal Presses / Pharmaceutical Equipment / Vacuum Equipment / High Vacuum Pumps and Gages / Special Machinery

MODERN PLASTICS

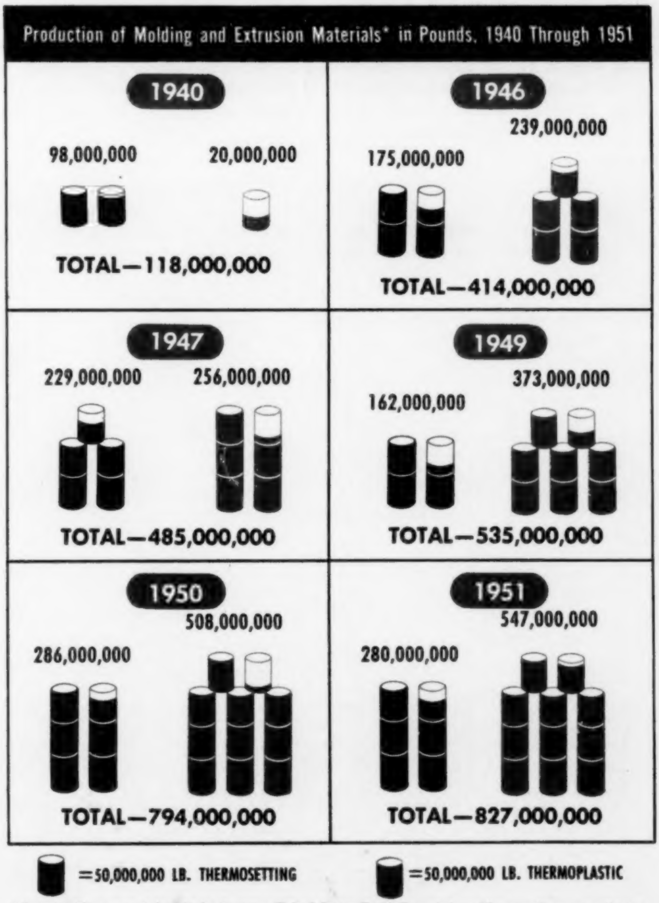
VOLUME 29 JANUARY 1952 NUMBER 5

Plastics Industry Trends

PLASTICS raw materials sales suffered a let-down in the last four months that cut the expected advance by a substantial amount. The industry went counter to past seasonal trends in that the first half of the year brought forth far more volume than the last half, although polystyrene and polyethylene volume was larger in the late period due to increased availability of resin. In other years, about 60% of the business was done in the last six months.

It has been extremely difficult to estimate the last three or four months because business has been spotty and, at the time of writing, sales managers were loath to predict what November and December would bring forth. A strange circumstance in most materials was that July and August were high volume months in comparison to what was expected in the last four. Ordinarily, July and August are the lowest months of the year. Unless November and December were better than expected, sales in the last quarter of the year will be lower than any other quarter in most materials. An outstanding exception is polyethylene, which has been scarce all year, but substantial increases in production starting in September will probably result in far larger volume sales for that particular material at the tail end of 1951.

Biggest surprise of the year was perhaps the failure of the Armed Services to procure more plastics materials, except for polyethylene,



* Includes fillers except for vinyls. Sources: United States Tariff Commission; MODERN PLASTICS estimates.

nylon, and Teflon. Military purchasing in 1951 didn't make a very big dent in the plastics supply line. Nearly everyone was happy about that in the first half, when processors wanted all the plastics they could obtain for civilian goods, but a few more military orders would have been most welcome in the last half.

It isn't difficult to guess the cause of the decline in plastics production in the last half of 1951. Manufacture of consumer goods, including automobiles, dropped precipitously, and, since many of them use a large volume of plastics parts, the result was inevitable. In the second half of 1950, consumer goods output was two thirds above the 1947-1949 average and continued high in the first quarter of 1951; by July 1951, output had dropped to 35% of the high first quarter, although it was still close to the 1947-1949 average. Stocks of consumer goods on hand are now above pre-Korea levels. If they should be reduced enough to cause a scurry for replenishment, there is enough metal available for production of consumer goods at a rate about level with 1951 third quarter production.

A few figures will illustrate what is happening: Passenger car production in 1950 was 6.7 million; 1951 will be about 5.3 million; 1952 is expected to be 4 million. Some 3.5 million vacuum cleaners were made in 1950; an estimated 2.6 million in 1951; possibly there will be 1.6 million in 1952. Refrigerator sales were 6.2 million in 1950, with an estimated 3.6 million in 1951. Television sets dropped from 7.5 million made in 1950 to perhaps 5 million in 1951.

At the same time all this was going on, retail sales of soft goods and house furnishings suffered a severe decline so that vinyl film and sheeting as well as polystyrene moldings were affected, even though both of them held a comparatively high level compared to competitive lines.

On the face of the above figures and lack of metal for civilian goods in 1952, the outlook is not particularly bright for increased sales, although as pointed out time after time, the last half of 1951 was not particularly bad in comparison with any similar period except the two just preceding.

If metal curtailment results in 1952 production at a rate equal to 1951 third quarter output, there won't be any records broken, but there will still be fair business. Furthermore, there are several basic factors that should be considered. Government defense spending will shortly increase from $3 billion to $4 billion a month. There is a surprisingly small number of unemployed workers; when people are working, they spend money. The year 1952 is an election year, and the Administration can be counted on to pull every string possible to manipulate money by government decree so that no serious deflation will occur in this particular year.

Figuring 1952 is tough; just as tough as trying to fathom what Joe Stalin will do next; but the first half at least looks as though it will be a repetition of the last half of 1951—just medium.

TABLE A—PRODUCTION AND SALES IN POUNDS OF SYNTHETIC RESINS AND CELLULOSICS USED IN PLASTIC*

	1946	*1949*	*1950*	*1951*
Cellulose acetate[1] and mixed esters				
Film, sheets, rods, tubes	19,900,000	19,200,000	27,500,000	34,200,000
Molding and extrusion	83,200,000	56,000,000	80,000,000	65,000,000
Nitrocellulose sheets, rods, tubes	18,300,000	7,000,000	7,400,000	6,900,000
Other cellulose plastics [1,2,4]	12,200,000	8,500,000	12,600,000	10,500,000
Phenolic and other tar acid resins [1,3,4]	241,700,000	250,400,000	372,200,000[8]	393,000,000
Urea and melamine[3,4]	89,300,000	115,800,000	185,100,000	181,000,000
Styrene and styrene derivative polymer and copolymer resins [1,4]	66,800,000	218,500,000	332,000,000	305,000,000
Vinyl resins[4,5]	152,700,000	302,200,000	402,000,000	500,000,000
Coumarone indene and petroleum polymer resins			143,600,000	147,000,000
Miscellaneous				
Molding materials[6]	15,000,000	41,800,000	60,300,000	95,000,000
Other uses[7,9]	35,700,000	83,800,000	59,100,000	80,000,000
TOTAL	734,800,000	1,103,200,000	1,681,800,000	1,817,600,000

*Source: U.S. Tariff Commission for all except estimated last four months of 1951. Production figures are used for 1946 and 1949 because sales figures were not available in those years. However, production and sales were so close together in those years that for comparative purposes the difference is not significant. On the other hand, a 1951 production figure would be misleading since production in many categories was running far ahead of sales at the close of the year.

[1] Includes fillers, plasticizers, and extenders.

[2] Includes sheets, rods, tubes, molding and extrusion materials, primarily ethyl cellulose and Valite.

[3] All dry resin except molding material which includes filler.

[4] Excludes data on protective coatings.

[5] Tariff Commission figures included filler for film and sheet every year except 1951. For comparative purposes in this table an estimated figure for filler has been added to the 1951 figure for film and sheet in order to show trends. For that reason, the total vinyl figure given here is not comparable for the official Tariff Commission figure that will be given by the government for total 1951 production of all vinyls including polyvinyl chloride and copolymers; acetate; alcohol; formal; butyral; and saran. See page 84 for vinyl chloride statistics.

[6] Includes acrylic, polyethylene, nylon, and other miscellaneous molding materials.

[7] Includes acrylic sheet, nylon, silicone, and hydrocarbons. Petroleum resins and coumarone indene are included in miscellaneous in every year except 1950 and 1951 when they were in a separate category.

[8] Production figure used instead of sales figure for laminating resins because many laminators produce a large amount of their own resin.

[9] Includes protective coating resins for every year except 1951 which was first year that coatings were given separately in Tariff Commission report. Coumarone indene and petroleum resins were included here in 1946 and 1949.

Materials Supply and Demand

CELLULOSICS

BRIGHTEST spot in the cellulosic plastics industry in 1951 was the progress made in production and sales of dry-extruded thin film less than 3 gage thick, as the figures in Table B plainly indicate.

Perhaps the significance of this development is best illustrated by the fact that Celanese, major producer of dry extruded film, cut its molding powder production far more than half when raw materials were short, so that they might use more of the limited supply of cellulose acetate flake for film. The company's capacity for extruded film has been increased 2½ times, and cast film by 50%, since January 1951.

Cast film and sheet has by no means been outmoded by extruded film since the former has certain properties, such as optical clarity, that are highly desirable for many applications, but the production possibilities of extruded film are so great that it has added a much broader base to the potential applications for acetate film. Sales of thin film under 0.003 gage varied from 1,100,000 lb. in February to a high of 1,600,000 lb. in June with a production figure in that month of about the same volume, which would indicate that the industry could produce around 20 million lb. a year before the new capacity came in this last December.

Chief Outlets

Acetate thin film has many uses, but the chief outlets at present are for packaging and for tape—electrical, recording, and pressure. It has found a market especially for produce, poultry, and other meats aside from red meat, in the fast developing self-service stores. As a temporary wrapper for chicken parts it has proved almost ideal, since it permits odors to escape. Since the market for produce and meat packaging in acetate is just in its infancy, and acetate has the advantage of most other competitive film in this "breathing" property, it is anticipated that volume will increase for some time to come.

A further broadening of the base for film applications is anticipated as a result of the development of a new transparent film in eight colors and two new formulations produced specifically for heat sealing and bags. One processor is also offering metalized acetate film that is being used widely in the display trade.

Military orders for under 0.003 gage film have not run more than 25 or 30% of production in any one month, but in case of another World War, the military might take all. In such a circumstance, the film would be used primarily for electrical tape, ordnance wrap, as a laminate in ration kit packaging, and probably in certain ammunition parts.

Decline in Demand

Cellulose acetate and cellulose acetate butyrate molding and extrusion material declined in 1951 for several reasons. One was the universal drop in demand for nearly all materials other than metal that began last summer. Another was the Celanese cut in production. It is not

Table B—Cellulose Plastics Sales In Pounds For 1951 and 1950 [a, b]

	First 8 mo. 1951	*Estimated last 4 mo.*	*Total 1951*	*Total 1950*
Cellulose acetate and cellulose acetate butyrate sheets:				
under 0.003 gage	11,100,000	5,900,000	17,000,000	12,200,000
0.003 gage and over	7,200,000	4,800,000	12,000,000	11,000,000
All other sheets, rods, tubes	3,900,000	1,300,000	5,200,000	4,300,000
Molding and extrusion materials	47,000,000	18,000,000	65,000,000	80,000,000
TOTAL			99,200,000	107,500,000
Nitrocellulose:				
Sheets	4,000,000	1,600,000	5,600,000	6,200,000
Rods and tubes	900,000	400,000	1,300,000	1,200,000
TOTAL			6,900,000	7,400,000
Other cellulose plastics, primarily ethyl cellulose and Valite	8,400,000	2,100,000	10,500,000	12,600,000

[a] Source for 1950 and first eight months 1951: U.S. Tariff Commission; last four months 1951 estimated.
[b] Includes plasticizers, fillers, and extenders.

expected that this company will ever return to its former large scale molding material production unless more facilities are built. It will continue to supply comparatively small quantities of clear and transparent color, but is concentrating mostly on its Group III material which is a lower cost and limited color range material. Hercules, which came into production a year or two ago, did not have enough facilities to completely fill the gap when Celanese curtailed production.

The difference can be found in monthly production figures which ran at a peak of 8,600,000 lb. in October 1950, but never exceeded 6,700,000 lb. in 1951 after January.

Butyrate Products

Tennessee Eastman's butyrate moved along in just about a parallel line with acetate insofar as sales were concerned. From June 1950 to June 1951 was a big year, with a decline the last half of 1951. Principle finished products now line up in about this order: automotive, communications, pipe, agricultural (irrigation) tubing, and hardware. Demand for extruded pipe, especially for use in the oil fields, has continued to expand and should get lots bigger; pipe may become one of the greatest markets for butyrate as well as many other plastics. The decline of automotive production—thousands of steering wheels and other parts use butyrate—offset the growing market for pipe in late 1951.

The situation in raw materials for acetate and butyrate for 1952 is by no means clear. If there is no greater demand than in the last half of 1951 there will be little difficulty, but if demand for molding material gets back up to 6 or 7 million lb. a month, many problems will arise. The cutback in sulfur, for example, means that carbon bisulphide, needed for cellophane production, will be short and a cellophane shortage means a greater demand for acetate film. Cellulose acetate and butyrate flake, ethyl cellulose, and cellulose triacetate film will also be affected. Other than sulfur, another shortage that isn't likely to be completely overcome in 1952 is phthalate plasticizers, a necessary part of acetate formulations. Another problem in 1951 was a shortage of wood pulp and cotton linters for flake. The supply of linters for 1952 seems assured, but the wood pulp supply is not too promising despite the new Celanese pulp plant in Canada.

Military Possibilities

The uncertainty about 1952 hinges largely on the military. If they buy up to possibilities, the amount of acetate left for civilian use might be (*Continued on p. 167*)

PHENOLICS

During 1951, NPA authorities were almost continuously under pressure to put through Certificates of Necessity for chemical firms who wanted to expand or build phenol plants. Practically every company now producing phenol, and several new ones, have just built, are now building, or have plans ready to go as soon as they can get structural steel and equipment. The amount of phenol to be consumed in 1951 is estimated at from 365 to 370 million lb. as against 312 million lb. in 1950. By the end of the first quarter of 1952, capacity is expected to be 460 million lb. and the goal for 1954 is over 600 million pounds.

Almost two thirds of present phenol production is consumed by phenol-formaldehyde resins. It is expected that the percentage used by phenolics will rise as phenol production becomes greater. Thus, *the phenol producers have their eyes on the plastics industry.*

This is all the more remarkable because only three years ago several phenol producers could see no expanding future and were singing the blues about excess capacity.

Adhesives Increase

The biggest percentage increase of all the phenolic resin categories in 1951 was in the adhesive type resin used for softwood plywood. It was one of the few resins in the entire plastics field that did not show a rather precipitous decline in the last six months. Sales held quite steady at between 3.3 and 3.8 million lb. per month all through the year in comparison to from 1.8 to 2.8 million lb. in 1950. The reason, of course, is the bumper production of softwood plywood in 1951—about 3 billion sq. ft. in comparison to an average of 1½ billion in the 1941-'45 period. Not all softwood plywood uses phenolic—only the exterior type, or about ⅓ of present production. This type goes into such uses as pre-fabs, trailers, railway cars, some concrete forms, etc. The percentage will grow—but about 50% of softwood plywood will probably always be interior grade. The present tendency, however, is to produce plywood that can be put to both exterior or interior use. Such plywood requires phenolic resin adhesives. In some military applications it is now required that interior grade must be bonded with phenolic resin. Hardwood plywood used only about 2 million lb. of phenolic resin last year because most of it is for interior use such as in furniture. The phenolic formulation generally used for plywood consists of 50 lb. resin and 20 lb. water. This 70 lb. will cover 1000 sq. ft. of 3-ply plywood.

Despite the drop from one million homes started in 1951 to an estimated 800,000 in 1952, it is expected that plywood production in 1952 will at least equal 1951. Military use has been taking 40% of phenolic type plywood and should continue at that rate or better. It is being used largely for domestic structural purposes, but seems ideal for Arctic structures and also in the tropics when treated with pentachloraphenol. As pallets for tanks that are dropped by parachute from airplanes, it has proved successful. This modern material, stronger in a ratio of 4 to 1 by weight than steel, would scarcely be practical for heavy volume use on exteriors without phenolic resin. Use of such surfacing materials as phenolic treated paper and alkyd type resin fillers increases the usefulness of plywood as an outdoor wall material.

Molding Powder Figures

The phenolic molding powder branch of the industry will probably end up with a record sales and production figure for the year. If more phenol had been available in the first six months, the record would be even better. In the first six months sales were running from 17½ to over 19 million lb. monthly, but declined to from 16 to 17 million lb. in the last six months. That latter figure is still good business—better

than most any other six-month period except late 1950 and early 1951. It is in fact a remarkable feat, considering the cutbacks that have been made in the automotive, television, and durable goods industry, all of which use millions of pounds of phenolics.

Production of molding powder may go over 230 million lb. in 1951, compared to 222 million lb. in 1950, since producers were building up depleted inventories in the last three months. Ordinarily, the production figure for phenolic molding resins is a better measure of total business than sales, since a large quantity of resin is made and used by the molders themselves; but in 1951 the production figure is considerably higher than sales due to the inventory build-up late in the year.

Military demand has not yet materialized to the extent expected. The industry is now governed by NPA Order M-32 which states that no producer may be required to furnish more than 35% of his production for DO orders, but at present the military is using far less than that amount. The feared effect of CMP DO orders, which would have allowed anyone to put in a DO order for plastics needed to go with any metal he might obtain under CMP, did not materialize because the government exempted chemicals, including molding powder, from the regulation.

Military Orders

Some molders may be running as high as 50% or more on military orders, but most of them have much less or nothing at all. Electrical and ordnance parts are the chief military items in production. A slight modification of the M-52 fuse is again in production, but the initial order was for only 700,000. Scores of items are under development and test—some of them might require big volume in case of a bigger war than Korea, but it doesn't look as if the present defense program will put too much pressure on phenolic molders even when it reaches its peak in 1953. At the peak of production activity in World War II, only 10 million lb. a month of phenolic molding material was used, both military and civilian, and no one has yet been able to ascertain whether the new type weapons and war equipment will use any more.

An interesting question is: will the industry ever need or use its estimated 30 million lb. a month capacity? Optimists believe that consumption might reach that point in three or four years if there is not too much interference from the defense program.

According to one analyst of the industry, present division of phenolic molded applications for the civilian economy is roughly as follows:

Automotive	10%
Appliance parts	25%
Radio, television	25%
Closures	10%
Wiring devices	20%
Miscellaneous	10%

All of these can be expected to make a normal growth in accordance with population growth; probably television and miscellaneous will make more than normal growth. Competition from thermoplastics, as well as urea and melamine, may eventually cut into or limit phenolic growth in each of these classifications, but informed opinion is that these other plastics will cut into the volume of metal, wood, ceramics, etc., used for these purposes rather than into phenolics.

Big and Little Pieces

That thermosets will continue to keep a grip on these various fields is the conviction of at least one producer of various phenolic resins. He insists that phenolic molded furniture is sure to come because it offers heat and solvent resistance, dimensional stability, good strength, and fast molding. He admits that the thermoplastic advocates won't agree to all these thermosetting advantages, but he is pushing development work on the theory that he is right.

Closures are another field where the competitors are always claiming that they are going to move in on phenolics, but they certainly haven't done it yet. (See Table D, page 80.) When other plastics do come into this field on a bigger scale, they will probably edge into the metal volume rather than phenolic.

Improvement in and development of new formulations to meet new problems and broaden the base of operations is also a never ending part of the struggle to keep phenolics in the limelight. There are scores of special purpose formulations on the market that few people ever hear of. For example, phenolic-furfural pipe is quite extensively used in chemical plants. Then there are the rubber-modified phenolic compounds, which although several years old and apparently not getting anywhere in particular, suddenly became the center of a promotion campaign in 1951. They have the glamorous property of high impact strength, but it has taken time to overcome the problems of cold flow, low temperature brittleness, and other properties inherited from rubber. A new formulation that would permit chrome coating was also introduced last year, but it takes a long time to get an innovation of this type adopted. It is expected to have great structural possibilities.

Miscellaneous Uses

The last item in Table C shows 1951 about even with 1950 in miscellaneous phenolics. The leading

Table C—Phenolic and Other Tar Acid Resin Sales in Pounds For 1951 and 1950[a, b]

	First 8 mo. 1951	*Estimated last 4 mo.*	*Total 1951*	*Total 1950*
Laminating Resins[c]	54,000,000	22,000,000	76,000,000	75,400,000
Adhesives Resins	26,500,000	13,500,000	40,000,000	29,300,000
Molding and casting	140,000,000	65,000,000	205,000,000	195,000,000
Miscellaneous for other than protective coatings	49,000,000	23,000,000	72,000,000	73,000,000
TOTAL			393,000,000	372,000,000

[a] Source for 1950 and first eight months 1951: U.S. Tariff Commission; last four months 1951 estimated.
[b] All on solid resin basis except molding compound, which includes filler.
[c] Production figures used instead of sales for laminating resin because many firms make and use large quantities of their own resin.

Table D—Plastics In Commercial Closures [1]

	Units[2]	*Lb. of Plastics*
1946	2,569,367	n.a.[3]
1947	2,230,166	n.a.
1948	1,994,976	20,389,540
1949	1,929,309	19,248,655
1950	2,546,211	24,554,506
1951 (Jan.-Aug.)	1,939,897	18,586,471

[1] Excluding closures for collapsible tubes.
[2] In thousands.
[3] Not available.
There was no breakdown between thermosetting and thermoplastic resins until August, 1951. In that month 2,300,000 lb. of thermosetting and 67,000 lb. of thermoplastic materials were used for closures.

volume items in this list include bonding resins for brake linings, abrasives, and mineral or glass wool. These bonding resins together probably consume over ⅔ of the miscellaneous volume. Other items in the miscellaneous group include resins for shell cores used in foundry work; waste wood; rubber reinforcement as in shoe soles; phenolic foam; oil seals for the petroleum industry; and several other unidentifiable uses.

Among the miscellaneous resins now picked for greatest future development are those used for waste wood and foundry shell cores. One producer estimates that by 1955 or 1956, waste wood may absorb 75 million lb. of resin. Other producers say he is over-optimistic. Present consumption for this purpose is thought to be much less than 10 million lb. annually.

There is almost unanimous opinion that the future for resins used for molds in foundries is tremendous. Although only a limited amount of resin was used in 1951, because not much equipment has yet been installed to handle this new process for bonding sand used in foundry molds, the estimates for possible use by 1955 or 1956 run all the way from 45 to 150 million lb. annually.

Phenolic foam also has good potentials. There are two types currently in vogue. One makes use of in-place foaming to fill voids in ship hulls, to furnish insulation in refrigerator systems, etc. In this process, a resin formulation is dropped into a cavity and a foaming agent then added which will cause the resin to expand to the desired proportions. With another type of resin, the user can obtain 2225 cu. ft. of porous material to be used for packing and other purposes from a 55-gal. drum of resin. The foamed material would take the place of excelsior—save floor space and present no fire hazard.

And as if all these things were not enough to stir the imagination, here comes a news release from Switzerland stating that lactum, a derivative of phenol, is being developed to make a new synthetic fiber called Grillon which, it is claimed, will equal nylon in many respects.

High Pressure Laminates

Operating at nearly its highest rate in history from September 1950 through May 1951, the high-pressure laminating industry reached its peak in March and April, then tapered off for the balance of the year like nearly all other branches of the plastics industry.

Phenolic type resin consumption

(*Continued on p. 169*)

POLYSTYRENE

BIGGEST rumpus in the plastics industry in 1950 was about the shortage of polystyrene. By the end of 1951, there wasn't a bleat about shortages, but the industry was keeping a watchful eye on the synthetic rubber program anyhow. The figures are a bit misleading, too, because much more polystyrene could have been sold and used in the first part of the year if it had been available.

After January and February 1951, sales of polystyrene varied from 20 to 24 million lb., with August the highest month. That wasn't quite as good as 1950, but the situation could hardly be described as bad either. There were complaints from many molders as far back as July that business had started to fall off, but sales of molding material kept on at a rate of 20 million lb. or more a month for the rest of the year, according to estimates from producers. Inventories of both resin and finished goods in the hands of molders were reported at a high level, too, but polystyrene continued to roll across the board anyhow. Perhaps the Christmas trade pick-up in house furnishings and toys eased the high inventory situation.

Then there are certain applications such as wall tile which are going great guns. One estimator says that consumption of wall tile increased to approximately 25 million lb. this year in comparison to 10 million lb. last year. On the other hand, there are several items like flower pots which were such simple jobs to mold that they grew so fast they soon saturated the market.

By and large, the styrene molding pattern in 1951 was quite similar to 1950 because material was relatively scarce and molders didn't go too much into new ideas. Of course, refrigerator and television parts slumped because of cutbacks, but since volume kept up so well anyhow, it is pertinent to point out that so-called small items are a highly important backlog in this industry. Just as an example, it is estimated that 75,000,000 lb. of polystyrene was used for housewares in 1950 and packaging (boxes) might have gone 30 million lb. in 1951 instead of an estimated 15 million pounds.

Large Molded Pieces

However, the most devastating effect of not having enough polystyrene early in the year and the uncertainty surrounding future supply was inability to get going on large pieces. If all plans for large pieces were perfected and could now be put into production, demand for polystyrene might well zoom up to 25 million lb. a month; if there were no metal problems to hamper production of refrigerators and other durable goods, that 30 million lb. a month dream of a year or two ago would soon be a reality. Reported to be on the way are a 4-lb. medicine cabinet; an 8-lb. bathroom water tank; a bathroom stool; a deep freeze cover; several pieces of furniture; various types of large housings; and even that fantastic plastic bee hive which was ridiculed a few years ago.

Furthermore, every producer is working on new and better formulations that will broaden the base of

the industry. Many of them are copolymers, but they are still styrene plastics. Some of the improved formulations that may be expected when increased supply of monomer becomes assured are those which will provide better light stability, higher impact strength, greater heat and flame resistance, and less static attraction.

The other items encompassed in Table E can be only briefly mentioned here. Everybody knows by now that the highly successful water or rubber based paints depend on styrene. Look at the figures—they ought to be convincing.

Table E—Styrene Resin Sales in Pounds For 1951 and 1950 [a, b]

	First 8 mo. 1951	*Estimated last 4 mo.*	*Total 1951*	*Total 1950*
Molding materials[c]	166,000,000	89,000,000	255,000,000	268,000,000
Protective coating resins	28,000,000	15,000,000	43,000,000	23,000,000
Resins for other uses[d]	34,000,000	16,000,000	50,000,000	64,000,000
TOTAL			348,000,000	355,000,000

[a] Source for 1950 and first eight months 1951: U.S. Tariff Commission; last four months 1951 estimated.
[b] Includes plasticizers, fillers, and extenders.
[c] Includes copolymer molding materials with styrene base.
[d] Includes high styrene-butadiene resins and polyesters based on styrene.

The high-styrene butadiene compounds used mostly for shoe soles and in floor coverings would have loomed much, much larger last year if styrene monomer had been available. Leather shoe soles are now reported to have only 42% of the market in comparison to 78% in 1942. Styrene-butadiene compounds have taken the rest except for a fairly small percentage made from rubber. A complete shoe made of this material with a built-in ventilation system has also been announced. The shoe sole type material is now also available in sheet form for luggage covering.

This "other use" category also includes the polyester resins. Estimators say total production of polyesters was between 12 and 15 million lb. in 1951; the military simply didn't come in with expected orders. They are still testing and the same remark made here last year still stands unchanged—"if one of several possibilities proves out, there wouldn't be much polyester left for other applications." The Navy has made some boats, but it's one here and one there—no great volume. Leading civilian uses were corrugated structural sheets and pipe.

What About 1952?

Now, how does the polystyrene supply picture look for 1952? The answer is: "Pretty good, but still 'iffy.'" After the first few months when the government will take more styrene monomer as it enlarges the synthetic GR-S rubber program from 760 to 860 thousand tons a year, there should be quite a bit more polystyrene available. Three producers are enlarging their capacities for both monomer and polymer, but one can scarcely believe all the tales that have been told about actual hardships in obtaining structural steel, equipment, and other things needed to build new plants. Styrene is not on the super critical list for obtaining steel, and as a result the CMP allocations for material to use in new plants have been constantly postponed. But producers have managed in some way or other to get part way squared off so that the outlook is about like this:

Styrene capacity at end of 1950— 660,000,000 lb.
Styrene capacity at end of 1951— 711,000,000 lb.
Styrene capacity at end of 1952— 880,000,000 lb.
Styrene capacity at end of 1953—1,100,000,000 lb.
Styrene capacity at end of 1954—1,180,000,000 lb.
Styrene used for rubber, 1951— 340,000,000 lb.
Styrene needed for rubber, 1952— 400,000,000 lb.

There is lots of news in these figures if one has the patience to dig it out. First is shown the faith of the producers in the future growth of styrene plastics, since it is doubtful if GR-S rubber production will very soon go over 860 thousand tons a year (requiring 400 million lb. of styrene), despite talk of a 960 thousand ton program. It would take a year or two to build new rubber facilities anyhow. Second: there are likely to be some new names among the producers. Third: is the new benzene capacity from petroleum going to come in fast enough to supply this need, especially if something should happen to stop our present rate of imports now netting 60 million gal. a year? Fourth: what would happen if the government stopped buying natural rubber at the rate of from 30 to 70 thousand tons a month for the stockpile? Would styrene then start running out of people's ears or wouldn't it?

Another interesting angle is Dow's announced new plant for producing vinyl toluene as a replacement or extender for styrene from benzene. The new $10 million or more plant is scheduled to come in soon and another may follow. The idea is to get away from complete dependence on benzene. But styrene monomer produced from toluene has always been high in cost, although it admittedly has some superior properties. Apparently Dow has learned how to control the cost factor. The trade believes that much of the new type styrene will be channeled into the company's latices business.

UREA AND MELAMINE

UREA and melamine resin business in 1951 was highlighted by various factors which finally resulted in the most interesting year since the war. A glance at the figures shows that resin sales of the combined materials in every category except adhesives were in advance of 1950, which was the largest volume year in history. This statement is based, of course, on the thesis that the estimate for the last four months is reasonably accurate. There is a great diversity of opinion about this estimate, but certainly up until September, the over-all figures for 1951 were good, except for adhesives.

Adhesives started to decline in May due to the slump in the furniture field where urea adhesives are extensively used. The hardwood

plywood industry also fell into the doldrums; urea glue is a primary ingredient in that branch of the industry. The urea glue business in the South, where sales are predominant, is going through a period of change from dry to liquid compounds, from a few major suppliers to a multitude of small suppliers. Price wars have been the inevitable result of these changes and sales managers have been at their wit's end to contend successfully with all the conflicting factors. It has been a hectic but exciting year in the glue business, heretofore the largest outlet for urea resins. The year 1952 is likely to be just as uncertain unless the furniture and hardwood plywood industries suddenly straighten out and get back on the same track they were on in late 1950 and early 1951. In that period their consumption was a major factor in bringing urea and melamine glue sales up to a monthly 7 to 8 million pounds.

Textile Treatment

The use of urea and melamine for textile treatment to impart permanent glaze, shrink proofing, antiwrinkle properties, and the like, plus their use in paper treatment for such things as sizing, water proofing V-board, strengthening wet-strength paper, etc., made good progress in 1951 and should continue in increasing ratio for several years to come.

Molded Melamine

The molding division of the industry was enlivened by the sensational demand for molded dishware for institutional, commercial, and home use, but there was insufficient material to meet this desire until the last 4 months of the year. Military orders alone account for several million lb. in contracts, already let or soon to be advertised, with a probable spread from the Medical Service and Army to the Air Force and Navy in the near future.

The two largest buildings in Washington, D.C. — the Pentagon and the new GAO building—have huge cafeterias completely equipped with melamine dishware. Yet molders claim they are already selling more tableware for home use than to any of the military, institutional, or commercial establishments. Producers aren't telling how much melamine compound was used for dishware in 1951, but we are advised that a guess of 10 million lb. is not too far off.

The trend in this direction is also toward more use of alpha-filled compound than rag-filled, despite the military's insistence on the latter. Many molders think that the difference in cost is not worth the difference in performance, since alpha-filled at 47¢ a lb. gives adequate properties at 10¢ a pound less than rag-filled. The latter is expensive because the finest cotton rags from bed sheets, shirts, etc., are the only suitable type, and the cost of obtaining well sorted rags is well nigh prohibitive. If the smallest scrap of nylon or rayon gets into the filler, the resultant molding is ruined.

Electrical Uses

Molded melamine pieces for electrical parts applications fared well in 1951. Melamine buttons increased partly because of military purchasing. The Army and Marine Corps insist on phenolic or melamine buttons, even for underwear, because the buttons must withstand sterilization and delousing treatment. The Navy doesn't seem to worry about "louses." They will accept urea in many cases. The Air Force frequently chooses melamine for buttons because of light fastness in light color tones needed to match their new blue uniforms.

Another upward trend was in asbestos-filled melamine, starting about last February. Most of it was for government rated orders in such things as aircraft connectors and magnetos.

Melamine-glass fabric also gained much more attention, and looks like a fine possibility for the future, especially for electrical panel boards.

Melamine decorative laminates exceeded all previous production periods in the first half of 1951, but slumped severely in the last half. One laminator estimates that about 25 million lb. of laminate were sold in 1951, which would account for about 9 million lb. of melamine resin, but other sources say that no such amount was available for laminating resin. For a further discussion of decorative laminate, see page 80 under Phenolics.

All this increase in melamine came about despite a resin shortage that plagued the industry throughout 1951 until September. The real pinch started about October 1950 when an upsurge in demand for molded dishware and military requirements for V-board, melamine treated textiles, and electrical parts became evident. The DO requirements increased steadily almost every month until the fall of 1951. A power shortage at Niagara Falls where calcium cyanide is processed into dicyanamid (raw material needed for melamine) complicated the problem. But even after the power shortage was remedied, dicyanamid was the bottleneck in melamine production until September, when the producer caught up with commitments. Since then, melamine production has been sufficient to meet current demand, but it is almost certain that demand is going to increase. At least the producer is planning more expansion. American Cyanamid told its customers in the spring of 1950 that its expansion program would mean 20 to 30% increase from its then current volume by late fall of 1951 and on top of

Table F—Urea and Melamine Resin Sales in Pounds, 1951 [a] and 1950

	First 8 mo. 1951	*Estimated last 4 mo.*	*Total 1951*	*Total 1950*
Adhesive resins	54,000,000	16,000,000	70,000,000	85,600,000
Textile treating	16,000,000	5,000,000	21,000,000	28,800,000 [b]
Paper treating	10,000,000	5,000,000	15,000,000	
Molding, laminating, and miscellaneous	53,000,000	22,000,000	75,000,000	70,700,000
TOTAL			181,000,000	185,100,000

[a] Source for 1950 and first eight months 1951: U.S. Tariff Commission report; last four months 1951 estimated.
[b] Only combined figure of 28,800,000 lb. for textile and paper treatment was given in 1950.

this, it has been announced that the Willow plant facilities, where melamine crystal is produced, will be further increased so that the capacity available in January 1951 will have been increased by 50% by mid-year 1952. As usual, however, no one can be sure of expansion plans today because of the problems existent in obtaining materials and equipment. Furthermore, it should be pointed out that production so far has not been at capacity because of the dicyanamid bottleneck. But since that problem has now been adjusted, production could be considerably more than 50% over the amount available in January 1951.

Other Producers

There is now much more activity in the melamine field than ever before by producers other than the present major one, but they are not yet ready to disclose future plans. Monsanto states that it will expand capacity for textile, adhesive, laminating, and surface coating resins. Plaskon is showing more activity in melamine molding material than previously. Fiberite started advertising melamine molding material in late 1951 and will reportedly have sizable quantities in 1952.

The U. S. Tariff Commission reports that 40,500,000 lb. of solid melamine-formaldehyde resins (including modified melamines and mixed urea and melamine resins) were produced in 1950. A supplier of raw material used in production of melamine resins says that sales of his product for this purpose indicate that about 60 million lb. of melamine will have been made in 1951 if his calculations based on 1950 production are correct.

Urea Molding Material

Urea molding material started off big in 1951, but sales began to decline in early summer just as they did in most other plastics. The melamine and urea molding powder capacity is now estimated at 80 million lb. and might even be increased by 20 or 30% with a few alterations and adoption of newer techniques. The figures on the division between melamine and urea are not certain, since facilities can be interchanged to produce either, but it is believed that a portion of the increase shown in 1951 over 1950 is due to melamine, with dishware alone amounting to quite a few million pounds. The miscellaneous material is rather insignificant when compared to the whole, yet one of the miscellany—urea used for sand cores—is reported to be several hundred thousand lb. in volume.

Closures, wiring devices, and buttons are the leading outlets for urea, with the top position varying from year to year. Urea boxes for display of such things as watches have made a comeback due to the tendency of competitive materials to pick up dust, but the market for clock housings has not been recovered since it was lost when urea was short. Stove hardware business was

(Continued on p. 172)

THE VINYLS

CONSUMPTION of vinyl resins of all types probably will go over 400 million lb. in 1951. From an almost negligible amount in 1941, the resins most commonly classified in the vinyl family have become one of the volume leaders in the plastics industry. If the plasticizers and fillers are added to the solid resin used, the vinyls are unquestionably the largest volume category in plastics. These materials include vinyl chloride and copolymers; butyral; acetate; alcohol; formal; and vinylidene chloride (saran).

This article is concerned chiefly with the vinyl chlorides, which probably constitute some 80% of total vinyl resin production. Since all the vinyls are grouped together in the Tariff Commission report, Table G has been prepared showing a breakdown for consumption of vinyl chloride and copolymer resins only. This table was prepared after consultation with various producers in the industry. It is, of course, only a rough breakdown in the division of categories, but it is believed to be well within a 12% margin of error. The total resin figure of 332 million lb. is believed to be very close to accurate, providing the last three months' estimates of sales are not overthrown by a more severe downturn in business than was anticipated. It should be emphasized that these are consumption figures—production figures will be considerably more for the year since nearly all producers were stock piling in the last three months following complete depletion of their inventories in previous months.

Although the industry sold approximately 40 or 45 million more lb. of resin in 1951 than in 1950, it wasn't as much as they expected to sell, based on the phenomenal sales of the last quarter of 1950 and first quarter of 1951. Much more could have been sold in the first half of 1951 if chlorine and plasticizers had been available in greater quantity. Perhaps it was fortunate that production was no greater in those early months, for resin users were buying all that producers would let them have in order to preserve their historical purchasing pattern. The material bought was placed in inventory as either resin or finished goods in anticipation of a heavy retail demand in the fall and expanded DO order business. Neither of the latter came through as expected, so many users were working off inventory in the later months of the year.

Capacity in 1955

In the meantime, the capacity of the industry is being steadily built up. It probably will be close to 450 million lb. by the end of 1951, may reach 500 million lb. in late 1953, and dreamers dream it may go higher than 600 million lb. by late 1955. Much depends upon availability of chlorine, acetylene, and monomer. A monomer plant is a big capital investment, but without its own monomer a polymer producer is severely handicapped. Every present producer has announced either an expansion or plans for expansion, and a new Shell Oil-Diamond Alkali combination plant in Texas was announced in 1951. Dow Chemical, in the monomer business for years, uses some itself for various purposes and sells a sizable quantity to polymer producers. Dow produces both chlorine and ethylene, and, altogether, is in a good position to enter the vinyl polymer field whenever the time is ripe.

Vinyl film (under 10 mils) lost its supremacy as the leading consumer of polyvinyl chloride resin in 1951, not because of a decline in

use, but because molding and extrusion types increased tremendously. Latter increase came largely from expanded wire coating needs of the defense program.

Total sales of resin for film failed to show the same percentage of increase in 1951 over 1950 as in other recent years, despite heavy buying in the first four or five months. That heavy buying continued—even after retail sales slumped and store shelves were loaded—because calenderers thought they would need resin in the fall and were afraid sufficient resin to meet demand wouldn't be available from September on. The anticipated demand didn't materialize.

Nevertheless, there was a tremendous amount of film sold in 1951. Measured by any previous standard except the glory months of October 1950 to March 1951, it was a big year. Calenderers had had a taste of operating around the clock —they like that—but they became weepy and morose when there wasn't enough business to support all-out operation. After all, it is quite significant and a tribute to their product that nearly all segments of the textile industry, in which vinyl film competes, suffered a much more severe decline than vinyl.

Furthermore, nearly all calenderers have increased their operating capacity. Most of them are now running their machines at 150 ft. per min. in comparison to a former 120. A few who have drilled rolls may average 240—can go to 290 on occasion. Many have added new equipment, and bigger calenders are on the way. General Tire has installed a super-giant. It has 42-in. diameter rolls—previous largest were 32. The idea is that the bigger rolls will employ more pressure and help to prevent deflection, thus minimizing the expensive process of crowning whenever the operator wants to change thickness of the film; or at least they will broaden the range of thicknesses that may be made without re-crowning.

Bigger Film Potentials

There should be little fear that permanent saturation has taken place. In drapes, the biggest outlet, vinyl materials have taken over only a part of their potential possibilities. It is expected that new styling to take advantage of improved embossing technique will widen the market to a considerable degree. Rainwear, too, is another field that can be extended far beyond its present high volume.

It is also expected that new markets will continue to develop for some time to come, just as they always have in this amazingly utilitarian vinyl film field. From shower curtains to table covers to drapes, the industry has gone from one big volume outlet to another. Who knows what will come next? Will it be wall coverings or window shades (both of which are still largely in the developmental stage) or something else that is still under cover?

Inflatables

Several possibilities lap over into the sheet field. One of these is women's booties which stormed the market last year. They have film uppers electronically sealed to sheet soles, can be rolled up and carried in a woman's bag. Another development that is already in big volume but seems to be on the way for much larger production is film and sheet for inflatable applications. It is estimated that 1951 production was almost double that of 1950, yet only two producers are making the material in large quantity. It is a special job since the film must be absolutely free of pin holes. Smart thinking by designers and merchandisers looking for new markets could increase demand for inflatable sheet many fold.

Vinyl Laminates

Laminated film or sheet, also in its infancy, may solve some of the problems of pin holes. It has been used mainly for back windows in automobiles so far, but has limitless possibilities. Experiments are now being tried to make it a cover or tarpaulin for armored tanks.

The possibilities of laminating vinyl to other plastics has dreamlike implications. Such a laminate would combine properties of various plastics to meet all sorts of demands.

An interesting trend in film during 1951 was the setting of two price levels. The lower priced material went into drapes and miscellaneous furnishings items; the higher priced was used for inflatables and wherever high quality appeal was wanted. Items like raincoats dipped into both levels.

Very Thin Film

Commercial application of extruded thin film of 2 mil or less thickness didn't make outstanding

Table G—Vinyl Chloride and Copolymer Consumption, 1949-51

	1949		*1950*		*1951*	
	Resin	*Compound with filler*	*Resin*	*Compound with filler*	*Resin*	*Compound with filler*
Film under 10 mils	54,000,000	84,000,000	81,000,000	130,000,000	85,000,000	135,000,000
Sheeting over 10 mils	30,000,000	54,000,000	64,000,000	119,000,000	70,000,000	127,000,000
Fabric coating	25,000,000	53,000,000	35,000,000	75,000,000	38,000,000	84,000,000
Paper treatment	5,000,000	7,500,000	7,500,000	11,500,000	8,000,000	12,000,000
Molding, extrusion	38,000,000	68,000,000	68,000,000	130,000,000	90,000,000	164,000,000
All other, including exports, coatings, and so forth	29,000,000	40,000,000	35,000,000	48,000,000	42,000,000	56,000,000
TOTAL	181,000,000	306,500,000	290,500,000	513,500,000	333,000,000	578,000,000

Table H—Production in Yardage Of Vinyl Coated Fabric and Sheeting Over 10 Mils Thickness For 1949 and 1950, With Monthly Production Through August 1951[a]

Year	*Coated Fabric Linear Yards*	*Sheeting over 10 Mils Square Yards*
1949	28,772,122	24,770,382
1950	36,561,646	43,219,422
1951		
January	3,599,002	3,966,467
February	2,977,364	5,190,954
March	3,542,536	5,973,023
April	3,945,291	4,289,186
May	3,471,791	3,594,920
June	3,272,455	3,464,877
July	2,511,428	2,670,124
August	3,315,150	4,201,569

[a] Source: Plastic Coatings & Film Association. Figures include only reports from association members. They represent 62% of coated fabric volume and 80% of over-10 mil sheet volume.

progress in 1951, but it remains a likely prospect when more experience is gained in technique. Two-mil film does have specialty marketing possibilities, but calenderers in general don't like to go below 3 mils and prefer 4 for quality purposes. The 2-mil or under film has so far been largely aimed at packaging but such uses will take a long period of development. The thin film has low oxygen transmission (which is good for some applications) but its water vapor transmission rate is too high for many varieties of produce and meats; on the other hand, it might work for coffee. For such things as candy, soap, etc., it has possibilities and the thicker films are now in use for self-sealing premium packs for stockings, handkerchiefs, tobacco, and other items where the product can afford the slightly higher cost of vinyl in comparison to competitive packaging films.

Over 10 Mils

Sheeting or film over 10 mils thick had a good year in 1951 despite the decline in furniture and automobile production. Most of it is in the 12- to 20-gage range. There was some complaint about the summer and fall slump, but it was the same old story of an increased capacity that had been built to handle the big volume in late 1950. The effect of the decline in furniture and auto production was somewhat offset by the use of vinyl upholstery on more types of furniture pieces than formerly; also, the ratio of vinyl upholstered cars is reported to have increased. The use of vinyl for luggage was also 25% up over 1950—91% of luggage manufacturers now use some plastic sheet or coated material in their lines.

The sheeting volume in Table G also shows an increase because practically all floor covering is now listed in this category—formerly a part of floor covering volume was in miscellaneous. The only exception now is the vinyl transparent coated paper type which is laminated to a specially prepared base.

Vinyl floor covering made fine progress through the year. It looks like this potentially tremendous volume outlet is finally on the way after several years of vicissitude.

There is also a good quantity of rigid vinyl sheet in these figures, but producers won't tell how much. Anyway, it's a good big hunk of the total. Rigid vinyl of other types than sheet is going to get much more attention in the future. Several extruders are turning out pipe for use in chemical plants, but it should spread out into many other fields. A special technique has to be followed when molding or extruding rigid vinyl. Each extruder must learn by experience.

Coated Fabric

Vinyl coated fabric moved along at a fair increase over 1950 but the industry was disappointed in the amount of government contract

(*Continued on p. 173*)

POLYETHYLENE, ACRYLIC, NYLON

THESE materials are grouped because they are listed in one category as "Miscellaneous" by the Tariff Commission. They are so listed because the government does not release figures by single product in commodities where only one or two companies are in production.

The last four months' production of 1951 for polyethylene, acrylic, and nylon plastics is the most difficult figure to estimate in the entire plastics field. Both polyethylene and nylon have come in with considerably increased production in the last four months, acrylic is going great guns in the automotive field, and there are so many unknown factors that an accurate estimate seems impossible. The 49 million lb. total for all these plastics from September through December is almost a tongue-in-cheek estimate.

Many critics think that figure is too high, but one authority who knows a lot about all three materials says that a total of 100 million lb. for the year may be expected.

Polyethylene is the largest contributor to this late season upsurge. Bakelite will have increased its capacity during this period by somewhere near two thirds (provided it is able to get needed equipment) and Du Pont is expected to increase by 25%, if current reports are true. These increases were to come in at different intervals during the last quarter. The total won't be known until Tariff Commission reports for the year are completed. By that time it is believed that total polyethylene capacity will be somewhere around 85 million lb. a year in comparison to approximately 55 million when polyethylene went on allocation last June. It is possible that by the end of 1952 or mid-1953 the two present producers will add additional facilities to bring production capacity up to 170 million lb. a year. Informed persons say that polyethylene production may even exceed vinyl within the next five or six years.

New Polyethylene Producers

There are many rumors about other firms entering the polyethylene field. Here are the facts so far as MODERN PLASTICS has been able to determine: Solvay has obtained a Certificate of Necessity to make polyethylene, but the best information obtainable is that production for the time being at least will be limited to low molecular weight material of the type used for wax coatings. Paper-treated bread wrappers are a typical use. This material is

Table I—Polyethylene, Acrylic, Nylon, and Miscellaneous Resins Sales in Pounds For 1951 and 1950[a]

	First 8 mo. 1951	*Estimated last 4 mo.*	*Total 1951*	*Total 1950*
Molding materials[b]	46,000,000	49,000,000	95,000,000	60,300,000
Resins for other uses exclusive of coatings[c]	58,000,000	22,000,000	80,000,000	n.a.
TOTAL			175,000,000	60,300,000

[a] Source for 1950 and first eight months 1951: U.S. Tariff Commission; last four months 1951 estimated.
[b] Includes acrylic, polyethylene, nylon, and other molding materials not covered in previous tables.
[c] Includes acrylic sheet; rosin modifications; nylon other than molding, but not for bristles or textiles; silicone; fluorocarbons; and other resins for miscellaneous use.
n.a. Not available. The 1950 comparative figure included protective coatings, and is thus not comparable with 1951 figure.

not suited for molding or extruding. Production should start this spring. No statement is available as to when, if ever, the company will go into production of the higher molecular weight material.

Standard Oil of Indiana (Indoil) has had a laboratory plant supplying small samples of polyethylene for several years. The company reports that it is actively at work but is still in the pilot plant stage. Standard Oil of New Jersey is frequently mentioned as pretty well along with plans for possible entry into the field but has made no public announcement of any sort on the subject. Standard of California is frequently named as an entrant into the field through Oronite, its chemical sales division subsidiary in California—but, again, no official word has been given. Gulf Oil, too, has been frequently mentioned, but doubtless it has been hooked up in the rumor column because of its announced plans to furnish ethylene to Du Pont for the latter's new plant in Texas. Shell Oil is always a possibility because it has been a pioneer in chemical development among the petroleum companies.

All chemical companies queried for this report have given a definite "no," but, of course, they can change their minds. It is also possible that one or two chemical companies may combine with an oil company in a joint venture. Since the patent for polyethylene expires in a few years, it is a likely supposition that most companies will keep their plans firmly under wraps until the patent business is cleared up. Furthermore, a tremendous capital investment is required; even more important is technical know-how.

Some British polyethylene was imported in 1951, but it has been reported that present capacity over there is not more than 6 million lb. a year. Unconfirmed reports say ICI expects to expand capacity in England as well as build new plants in Canada, Italy, and Belgium.

Polyethylene was placed on allocation last year because the Signal Corps needed great quantities for assault wire and there was not enough for civilian demand even before Korea. In the first two or three months of allocation, the military demand was almost 50% of production, but gradually declined to 33% in November. However, essential civilian demand has gone up to 43% of production. The chief classifications obtaining polyethylene for essential civilian use in October, according to percentage of essential material available, were: packaging, 39; wire, 28; mine pipe, 14; camelback, 12.

After material for allocation has been set aside, the balance is turned back to producers to distribute to their customers as they see fit. This percentage got as high as 24% in October and should get higher for a temporary period at least, but there may be troubles about next February due to certain manufacturing problems involved in expansion plans. It should be remembered that 24% of total poundage now is much more than it was last summer. But the military demand must be watched. No matter how international affairs go, the military are just plumb full of ideas about things they would like to have made out of polyethylene.

The over-all situation in polyethylene for 1952 is shrouded in uncertainty because of this potential military demand. Civilian demand is so heavy that it might well require all production available; when military demand is piled on top of that, it is difficult to tell how well civilian applications will fare.

Acrylic is Up

Acrylic production was said to be larger in 1951 than any year since the war. Some estimators say that molding powder alone must have reached around 25 million lb., with automotive parts the leading outlet. Large molded pieces also seem to offer a promising future. Molded windows with panes and sash bars as integral parts and the large bowl-shaped fruit juice receptacle used at soda fountains are examples.

Extruded acrylic parts for lighting fixtures also moved into prominence last year. The new General Accounting Office, largest building in Washington, is equipped with 25 miles of semi-cylindrical 4-in. diameter acrylic extrusions, each 24 in. long. It is estimated that 70,000 lb. of acrylic were used for the job. Several other government buildings have been similarly equipped.

Acrylic sheeting also had a big year. Production aproached wartime peaks when 30 million lb. or more was produced in one year. About 40% was for military use.

Large signs were the chief civilian application of acrylic in 1951, but corrugated glazing formed from flat sheet gained considerable momentum. It is used for skylights and can be mated with corrugated metal without need for a frame or sash.

Nylon Plastics

Nylon plastics came into surprisingly large production last year, but the producer will give no hint as to quantity. It was on allocation practically all year, but military demand dropped and production became so improved after October that there was talk of removing the allocation order. The big military demand was for jacketing on assault wire. Many developmental projects were put on the shelf early in the year when material was tight, but recently molders have been urged to get back on the beam with all their possibilities.

Application Trends in 1951

FROM the standpoint of plastics applications, the record of 1951 is quite similar to that of 1950. The flood of defense applications, which many expected, turned out to be more than a trickle, but not much more. As a result, civilian applications which were new in 1950 were expanded, and many new applications were introduced during 1951.

But there were not as many new applications, nor were they as varied, as there might have been. The constant possibility that large-scale military and essential applications might take the major portion of available plastics materials acted as a deterrent to many manufacturers who might otherwise have introduced new consumer applications. It does not make sense to spend money developing and promoting a new item only to be forced to discontinue it for lack of materials, thus giving competitors a chance to copy it before it comes back on the market. As a result, many new plastics items which might have seen the light of day in more normal times exist today only on the drawing boards. Others have proceeded further—molds have been made and put on the shelf to await the outbreak of peace or some other auspicious moment for the introduction of the item.

Military

It is difficult to obtain an exact picture of the status of military applications today, primarily because any application which is really new or unusual is promptly classified confidential or secret by the military authorities. The MODERN PLASTICS articles in the March, April, and May issues entitled "The Promise of Reinforced Plastics in Defense" reviewed some of the development programs which seem to be the forerunners of large scale applications of polyester-glass fiber materials. The Navy, for example, was testing 36-ft. long reinforced plastic LCVP's (landing craft, vehicles, and personnel). Various branches of the military were experimenting with glass-reinforced polyester pipe and tubing.

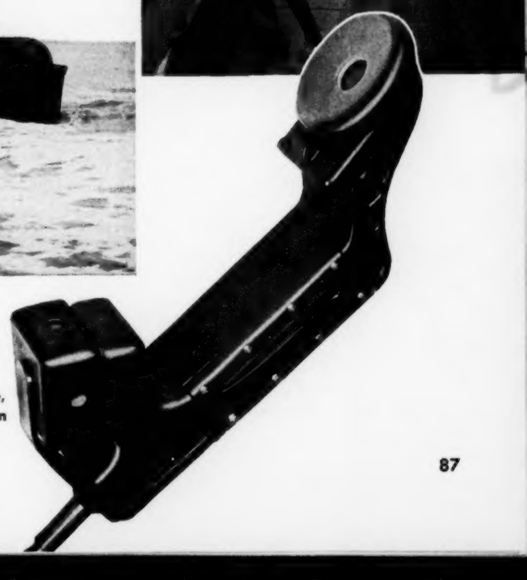
Radomes, one of the earliest and best-known applications of reinforced plastics, continued to get bigger and better. One radome 28 ft. in diameter was in production.

A newly developed igloo-like shelter, made of glass mat and poly-

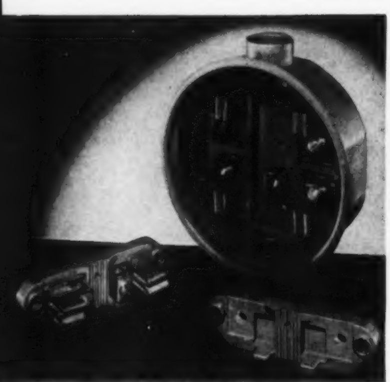
Courtesy Bureau of Ships, U.S. Navy

U. S. Navy is testing 36-ft. long LCVP made of reinforced polyester, may soon order large scale production of such plastic landing craft

Photos courtesy Electro-Voice, Inc.

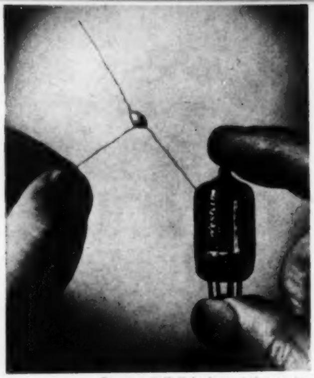


Telephone handset for LVT is sometimes dragged behind vehicle, must meet rigid specifications. Instrument is molded of nylon



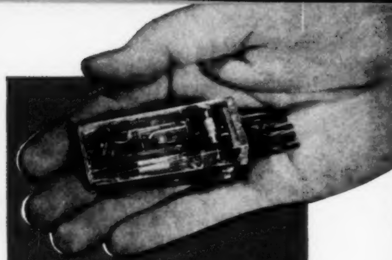
Courtesy Plaskon Div., Libbey-Owens-Ford Glass Co.

Alkyd material found many electrical uses. These are watt-hour meter parts



Courtesy Bell Telephone Laboratories

Unusual example of potting is junction transistor (left) cast in polyester



Courtesy Sylvania Electric Products, I

Example of complicated circuit pott in plastic is electronic unit for a borne telemetering system. Two su miniature electron tubes and oth parts are mounted on thin panel, the [illegible]

Courtesy Dynakon Corp.

Railroad tie plates molded of glass and polyester last longer than steel

ester resin, was being tested by the Alaskan Air Command. The shelter, made up of 12 identical sections, has the advantages of being strong, light in weight, easily disassembled, and air transportable.

Molded nylon was known to be finding its way into many military applications, but most of them were highly classified. One interesting exception was the telephone handset for an LVT (Landing Vehicle Tracked). This instrument, which is used for communications between the crew of the vehicle and the supporting troops, is connected to the LVT by a 25-ft. cord which automatically reels up when the instrument is not in use. Molded nylon proved to be the only material which could meet the rigid specifications for the handset housing. (See September issue.) Among other tests, the nylon housing had to stand being dragged by the cord at 25 m.p.h. over a dirt road for one mile.

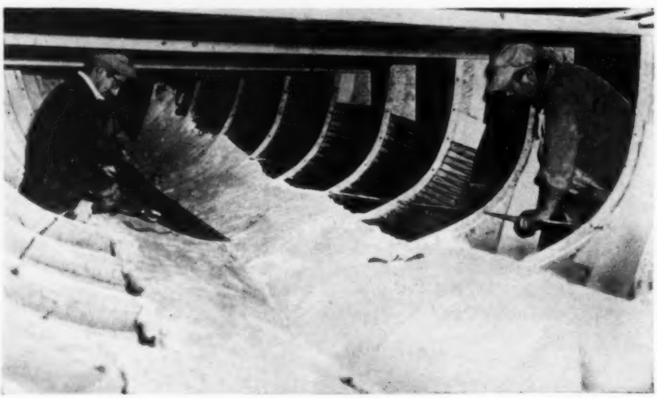
Another military application which was unclassified was the redesigned portable desalting kit used as survival gear by personnel lost at sea. The most important part of the kit (November issue) is a desalting bag made of flexible vinyl, rigid vinyl sheet, and molded rigid vinyl.

Undoubtedly, the few military applications mentioned above were only a small percentage of those in production. But even these few represent an increase over 1950. It is significant to note that the review of plastics applications during that year (January 1951 issue, p. 65) did not include a section on military uses.

Industrial

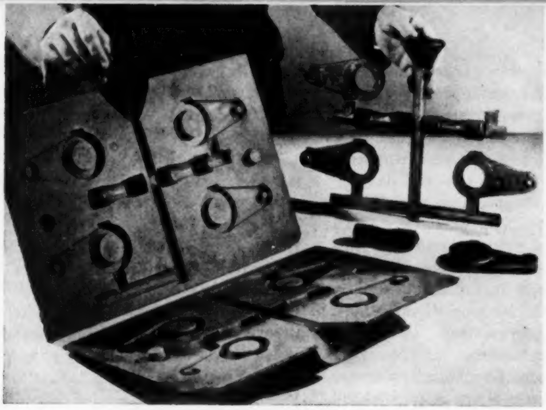
One of the most important industrial applications of 1950 was the use of phenolic or urea resins in the production of sand foundry molds and cores. In 1951, this application proved itself further in actual production use (June issue) and, as a result, was widely adopted. The year 1951 also saw the beginnings of another use of plastics in the foundry. Reinforced plastic coredriers and coreboxes were being used in some foundries to support the sand cores as they are conveyed through the baking oven. Their use made more practical the use of electronic baking. (See December issue.)

The installation of large injection machines with capacities up to 300 oz. indicated that the molding of large thermoplastic industrial pieces



Courtesy *The Providence Sunday Journal*

Among the plastic boats built in 1951 was a reinforced plastic ketch 42 ft. long. Hull was made in female plywood and plaster mold. Glass cloth was cut to fit mold (above)



Phenolic resins for binding sand foundry molds were introduced in 1950; were widely used in 1951 as experience proved their economy

Among the few unclassified military applications was new version of desalting kit used in World War II. Bag in which water is desalted is made of flexible and rigid vinyl sheet

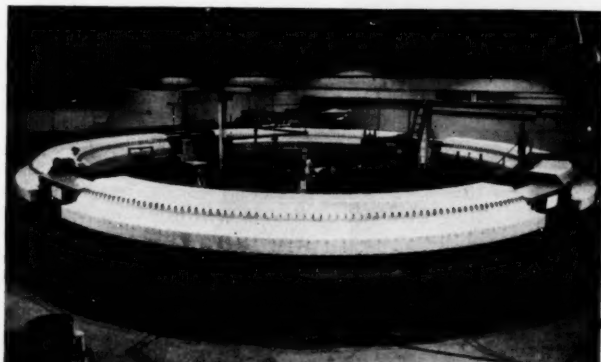
Courtesy The Permutit Co.

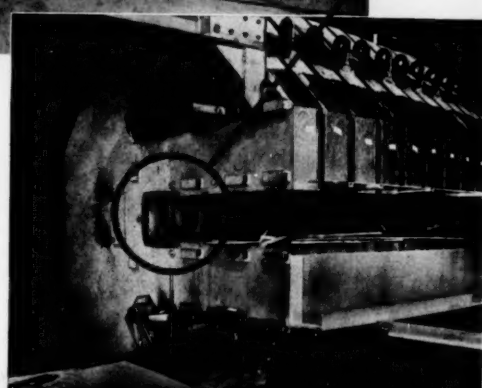
was just around the corner. One of the first uses for such machines was to produce large one-piece styrene battery cases. One such case weighs 5 lb., measures 10¾ by 15½ by 5⅝ in., and has a 5/16 in. wall section. Another such case weighs 4¼ lbs.; still another weighs 4 pounds.

Phenolic industrial laminate insulators played an important role in the Cosmotron, a large atomic accelerator constructed at Brookhaven National Laboratory. The heart of the Cosmotron is a 2200-ton magnet made up of a ring of 288 octagonal pieces, each with a U-shaped slot. A gap insulator made of postformed cotton-base phenolic laminate goes in each slot.

Printed circuits made by the foil etching method (August issue) found a few volume applications and seem destined for even more widespread use. This method of producing such circuits makes use of paper base phenolic laminate with thin metal foil laminated to one or both sides. An acid resist conforming to the desired conductive pattern is printed on the surface of the metal foil, and the unwanted portions are then chemically etched away.

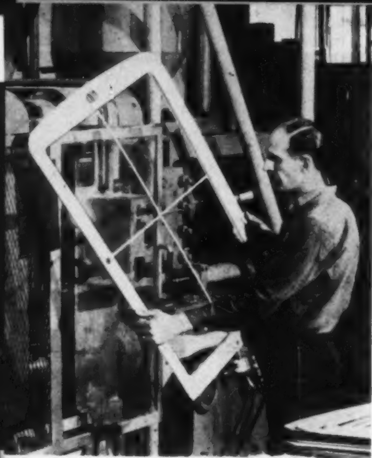
Potted circuits also found many applications during the year in hearing aids, as well as in numerous high frequency circuits in military equipment. (See March issue.) A specialized application of the potting technique made possible the development of the junction transistor, an amplifying device which does the job of a vacuum tube, but is only





Photos courtesy The Formica Co.

Unusual application of phenolic laminate was in atomic accelerator. Large magnet ring is made up of 288 sections. Gap insulators which are located at base of U-shaped slots are made of postformed cotton base phenolic laminate



Courtesy The Hydraulic Press Mfg. Co.
One-piece refrigerator breaker frame is molded on 60-oz. injection machine

Courtesy Fresh'nd-Aire Co.
Humidifier with styrene housing and parts takes place of metal-housed model

Vacuum cleaner uses plastics for 16 parts formerly made of other materials
Courtesy Lewyt Corp.

half the size of a garden pea. The junction transistor is a tiny rod of germanium, treated so that it embodies a thin electrically positive layer sandwiched between two negative ends. The entire rod is encased in a cast polyester bead 3/16 in. in diameter.

Numerous electrical applications of alkyd molding compounds were also developed during the year. Included were terminal boards for magnetic motor starters, rotors for magnetos, automotive ignition coil tops, ratchets for light switches, and parts for watt-hour meters. (See April issue.)

Numerous varied uses were found for adhesive-backed, pressure sensitive oriented polyethylene tapes. (January issue.) Such tapes are now available in thicknesses of 5 or 7 mils, in widths from ½ to 22 in., and with various tensile strengths. They are used for insulation in splicing electrical conductors, as specialized packaging sealants, and for corrosion-protection of metallic surfaces such as pipes in refrigeration or chemical processing.

Transportation

In the automotive field, there were few *new* applications of plastics, mainly because the automotive industry had once again entered a period of relatively static design. By the end of the year, this situation was recognized by a government order further restricting design changes for 1952 in passenger cars. The polyethylene spring liners, first mentioned in these pages early last year (February), were practically the only major innovation in passenger cars insofar as plastics were concerned. The established uses of plastics in the field, such as vinyl upholstery in certain models, acrylic lenses, etc., continued to gain ground.

In trucks, the outstanding plastics development was the introduction of a large truck-trailer built on the same principle as the Unicel freight car. The new trailer is made of fir plywood bonded and laminated with a phenolic resin adhesive into sections which, in turn, are bonded together with resorcinol to make a single-unit trailer. Wearing surfaces of the trailer are made of phenolic-impregnated paper and never need painting or refinishing.

Reinforced polyester boats, already a well-known, well-accepted application, continued to increase in size. The largest Fiberglas and plastic hull ever built was that of a 42-ft. sailing ketch. (See August issue.)

Railroad tie plates molded of fibrous glass and polyester resin (November issue) showed great promise. These tie plates are lighter in weight and last longer than steel plates, and, because of their resilience, result in a smoother ride for railroad passengers.

Electrical Appliances

In refrigerators, the widespread use of molded plastics components was already well accepted by the beginning of 1951. The major development during the year was the use of the larger molded pieces made possible by the installation of large injection machines. A one-piece inner door liner 34 by 34 in. with a ⅛-in. wall section was one of the largest area pieces ever injection molded. Among the other large refrigerator parts being molded were one-piece breaker frames (including one 52 by 28 in.) and evaporator baffles.

There were indications that even larger pieces would soon be injection molded, and at least one refrigerator manufacturer was known to have ordered a one-piece polyester-glass refrigerator interior for a 1952 model.

Products of the larger injection machines were also used during 1951 in air conditioning equipment and in dehumidifiers. One air conditioner has a 33½-oz. front panel 27 by 13 in. molded of styrene or acrylic. One dehumidifier contains an interesting drip pan which has eight rectangular openings molded-in to its sides.

Turning from dehumidifiers to humidifiers, we find an appliance (March issue) which has a reservoir, motor base plate, louvered cowl ring, and top grille molded of styrene. This home-size model supplants an earlier model in metal with resultant savings in weight and production costs, and a number of operating advantages. Another humidifier (December issue), produced for industrial uses, has molded phenolic and styrene components which also replace metal.

In vacuum cleaners, the big news of the year was the adoption of

plastics in the Lewyt cleaner for 16 parts formerly made of steel, aluminum, zinc, or rubber (October issue). The use of plastics made possible savings in cost, reduction of weight, and, in some cases, quieter operation and/or better finish. Most of the parts involved are being made of acetate, but the dust bowl and two other large parts of the cleaner are being made from fibrous glass and polyester resin.

Another use of plastics in appliances is the adoption of vinyl-plastisol coated black iron racks instead of stainless steel racks in at least three different dishwashing machines.

Housewares

For the reasons outlined above, nothing really startling happened in the housewares field insofar as plastics were concerned. The new products introduced included cannister sets, bread boxes, juice shakers, and salt and pepper shakers. All of the established applications seemed to be increasing their volume. Notable among these were plastisol-coated dish drainers, embossed vinyl table mats, vinyl tablecloths, ice cube trays, and others.

It was particularly interesting to note that melamine tableware continued to expand its markets rapidly despite an all-out attack upon it by the Vitrified China Association. (See November issue.)

Furniture and Decoration

In the furniture field, the trend towards the use of melamine decorative laminates in almost any place where wood veneers are used gathered momentum during the year. More and more dining room sets, occasional tables, desks, chests of drawers, and other wooden pieces were faced with plastic laminates.

Vinyl upholstery found new markets as more and more embossed patterns were introduced. The new patterns, many of which were almost indistinguishable from expensive fabrics to the unpracticed, naked eye, opened to vinyl upholstery doors which were previously slammed in its face.

Woven saran, usually in combination with aluminum tubing, was used more extensively than ever before to make weather-proof outdoor furniture.

Glass fiber lamp shades came into their own because of the development of efficient methods of manufacturing heat sealed fibrous glass and vinyl resin shades. (See August issue.)

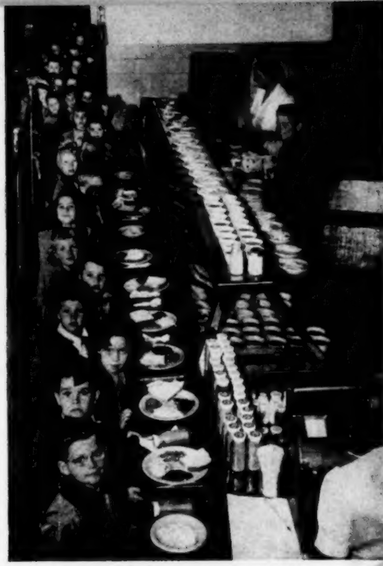
Vinyl flooring began to have a tremendous impact on the hard-surface flooring market for home use. In roll form and in tile form, flooring made of vinyl was expanding its share of the market in competition with rubber tile, linoleum, and asphalt tile.

The use of decorative laminates by the home handyman was enlarged by the introduction of a continuous decorative polyester laminate with a back surface pre-coated with cement. This material can be bought in rolls, can easily be cut to size, and its cement can be activated by means of a solvent. (See August issue.)

Another new form of decorative laminate, introduced near the end of the year, was the one-piece molded-to-shape melamine laminate sink top. This development is undoubtedly only the first of many applications where melamine laminate can be used better if it is molded-to-shape instead of fabricated from flat sheets.

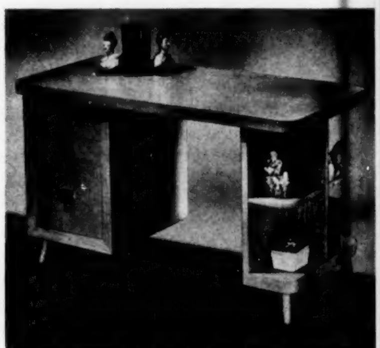
Architecture

In the building field, the most notable plastic material was undoubtedly the corrugated polyester and glass fiber material originally developed for skylights and side-lights in corrugated metal or asbestos buildings. Up until 1951, only two manufacturers were producing the material. By the end of 1951, there were about a dozen. The two original manufacturers of the material



Courtesy American Cyanamid Co.

Melamine tableware was widely adopted for use in schools and institutions

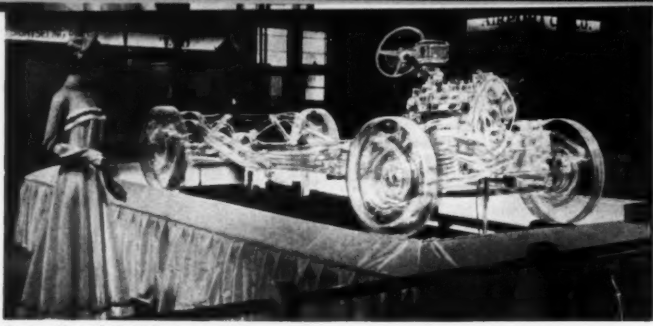


Courtesy Ashley Furniture Corp.

Desk surfaced with melamine laminate is an example of material acceptance

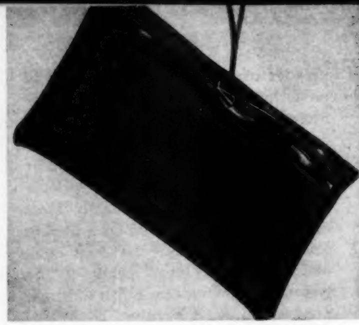
Courtesy B. & W. Upholstering, Inc.

The development of new embossing techniques made possible the production of vinyls with richer appearance, such as the leaf-pattern material used on this sofa and chair



Courtesy Plymouth Motor Corp.

Because of its transparency and formability, acrylic continued to be used in displays ranging from simple transparent housings to this 1200-part model of an automobile chassis and engine



Slide fastener is made of two interlocking vinyl extrusions. Slider is molded of nylon

brought out flat sheet materials during the year and one of them introduced a material which is transparent instead of translucent. (See December issue.)

Toys

The reluctance to introduce new products was even more evident in the toy field than in housewares. Plenty of new items were introduced, but they were new designs only and none of them made any new and different use of plastics. The trend towards military toys, already evident late in 1950, gathered momentum during the year. The long-standing trend towards greater realism in toys continued, as partly evidenced by the increased use of life-like vinyl plastisol doll parts.

Signs and Displays

The major innovation in signs and displays was the introduction of signs made of cast vinyl plastisol sheet which had the unique property of sticking to any smooth surface without the use of adhesives and of being readily removable. Such signs (see November issue) offer many advantages over decals or paper stickers.

Acrylic continued to be used for large signs, some of which were competing with neon successfully because of their lower cost, relative freedom from breakage, easier upkeep, and all-over illumination. Such signs were adopted by a number of large oil companies for their service stations, by appliance companies for their dealers, and by beer companies to identify taverns where their products are sold.

An interesting use of the transparency of acrylic was the full-scale see-through model of the engine, chassis, and wheels of a Plymouth built for display purposes. The display was made of some 1200 parts, each of which was fabricated to resemble the corresponding part of a real car.

Formed rigid vinyl three-dimensional signs and displays also found increasingly wider application during the year.

Apparel and Accessories

Big news of the year in the clothing field was synthetic fibers. (See September issue). Orlon, Dacron, and Dynel were beginning to become familiar words to the consumer, and none of them had done more than nibble at the edges of the portions of the market which will undoubtedly ultimately be theirs. Orlon shirts, Dacron ties, and Dynel blankets were among the consumer items already in retailers' hands. Millions were being spent to build plants to produce these and other synthetic fibers.

Plastics were also beginning to be used to make fasteners of various kinds for clothing. An extruded vinyl slide fastener was introduced (September issue), as was also a molded acetate snap fastener.

Boilable vinyl film moved into a number of applications, particularly nursery items, such as baby pants.

Vinyl also showed up in innumerable wallets of varying design. The availability of satin embossed, polka dot, cameo embossed, and other vinyl materials with high fashion appeal made such wallets particularly acceptable to women. The perfection of electronic sealing methods, making possible strong, neat-looking welds, was also a help in securing consumer acceptance in this field. The success of such wallets, which was little short of phenomenal, encouraged manufacturers and consumers alike to try matching handbags and other accessories.

Rust-proof snap fasteners molded of acetate can be used on vinyl raincoats, aprons, etc.

Blouses were among the first consumer items made of Dacron, versatile new polyester fiber

Courtesy E. I. du Pont de Nemours & Co., Inc.

Industry Expansion Plans

ALL producers of plastics raw materials were asked by MODERN PLASTICS for a resumé of their expansion plans but, unfortunately, several were not in a position to give specific answers. Some have applied for Certificates of Necessity which have not yet been acted upon; others are not certain when they will be able to obtain structural materials and equipment; still others are not certain about the supply of chemicals which will be needed to make plastics. As a result, the following report is not complete, but it does give a cross section of the industry and at least a partial idea of what may be expected in the future.

American Cyanamid Co.—During the past 60 days, the company has brought into production expanded facilities for melamine. During the first half of next year, additional melamine capacity will become available. Resin and molding compound manufacturing facilities will be expanded to keep pace with the demand.

Catalin Corp. of America—Equipment at the Fords, N. J., plant for cast phenolics has been sold to Marblette Corp. The buildings formerly used for cast resin, together with new equipment costing approximately $700,000, will be used for polymerizing styrene monomer at a volume of about 1 million lb. a month. Production is planned to start in about a year. Construction of a $4,300,000 unit is under way for increased production of Novolak resins. These phenolic base materials are used for grinding wheels, brake linings, adhesives, and sand molds.

At Calumet City, Ill., a new plant for liquid resins was completed in 1951. At Thomasville, N.C., another building has been added to existing facilities for the production of liquid urea resins.

Celanese Corp. of America—The Plastics Div. completed a two-year expansion program for acetate sheeting and films in December 1951. The Newark and Belvidere plants in New Jersey are now producing sheeting—0.003-in. gage and up—at a rate double that of January 1951, and transparent films at a rate of 2½ times January 1951. The two plants will continue to make limited quantities of acetate molding compounds.

Extensive research into the problems of packaging fresh foods, fruits, vegetables, and meats was started at the Celanese Central Research Laboratory, Summit, N.J., during 1951.

The Dow Chemical Co.—Expansion program concerns only polystyrene and saran. No increases in other materials are planned for the near future. The polystyrene expansion is a three-phase program including increased production facilities at Midland, Mich., in Connecticut, and in California, which will increase Styron production a total of about 40 percent.

At Midland, a new production wing is being added to the plastics building for the manufacture of Styron 475, a high-impact polystyrene, and Styron 671, a high heat resistant copolymer.

At Allyn's Point, Conn., construction is nearing completion on a new plant on the Thames River. This will facilitate bringing monomer directly from Freeport, Texas, via water.

In addition, a site has been obtained in the Los Angeles area for the construction soon of another Styron plant.

Depending on the availability of materials, the company plans on increasing saran production by more than 50% within the next two years. The location of these facilities is at present indefinite.

E. I. du Pont de Nemours & Co., Inc.—Late in January, 1949, Du Pont brought into production at its Sabine River Works near Orange, Texas, a new plant for making Alathon polythene resins. A step-wise program to increase production was inaugurated later which has raised 1949 capacity by more than one third to date and which, when completed in August, 1952, will more than double the original capacity. A substantial expansion beyond this point is now being planned.

Durez Plastics & Chemicals, Inc.—The new basic research laboratory at LeRoy, N.Y., is nearing completion and will be ready for occupancy not later than January, 1952.

In addition, the company has received a Certificate of Necessity for and intends to build a new phenol plant which will just about double their present production of that material.

Plastics facilities to use the phenol are planned and are in the engineering stage, and it is hoped to have these facilities available at about the same time that the phenol plant is completed.

Total expenditures for which contracts have been let or for which engineering is in process will exceed $12 million over the next two years, entirely for phenol and phenolic plastics.

Firestone Plastics Co., Inc.—Vinyl resin production facilities in the Pottstown, Pa., plant were increased by 50% during the past year. An-

other major expansion is under way for 1952 production, but no details are available.

B. F. Goodrich Chemical Co.—Expansion plans for the manufacture of Geon polyvinyl materials will keep pace with the expected demand, depending, of course, upon the supply of raw materials available to utilize the full capacity of the plants.

The company's vinyl resin capacity has been increased 30% over that of last year with the completion and operation of the Avon Lake, Ohio, installation. Production started at Avon Lake in mid-1951 and was in full swing in November. The company now operates vinyl resin plants in three locations—Avon Lake, Louisville, and Niagara Falls.

The completion of the vinyl chloride monomer plant at Calvert City, Ky., late in 1952 or early in 1953 will enable the three resin units to operate at full capacity. This will add another 20% to the total output of Geon materials.

General Electric Co.—Contemplated expansion plans call for more than double present capacity for the company's rubber-phenolics.

The M. W. Kellogg Co.—A new plant that will increase production of Kel-F by five times its present volume is planned for completion in Jersey City, N.J., some time late in 1952. The new plant will be placed on a continuous operating system to meet the ever-increasing needs of both military and civilian demand.

Koppers Co., Inc.—Styrene monomer capacity will be increased 33%; polymer capacity will be increased 30%, but it is not expected that the new facilities will be in operation before the middle of 1952.

Marblette Corp.—Additional manufacturing equipment has been acquired for the purpose of expanding cast phenolic production. The company states that the new facilities will make Marblette the country's largest producer of cast phenolic.

Monsanto Chemical Co.—The Plastics Div. disclosed the appropriation of its "biggest budget in history" to cover an intensified research program. The 1952 program, it was explained, provides for increased emphasis on fundamental and application research. Substantial expansion of the Plastics Div.'s research facilities in Springfield, Mass., was announced in December.

Production facilities at all Monsanto locations, limited by the diversion of styrene monomer to the government's rubber reserve program in 1951, are expected to move into high gear in the coming year. Optimism for 1952 is based on the current expansion of the company's monomer plant at Texas City, Texas. Capacities under installation at Texas City are considered sufficient to supply the company's styrene plastic requirements and to meet the demands on Monsanto of the Federal synthetic rubber program. Completion of the expanded facilities by mid-year would coincide with the company's schedule for initial operations at the new Port Plastics plant, located last year at Cincinnati, Ohio, as a source of supply for Midwestern molders. Port Plastics is expected to add approximately 40% to the total capacity for production of sytrene plastics. Doubling of Monsanto's Long Beach, Calif., unit was announced by the company's Western Div. last year.

Full operation of vinyl resin producing equipment, substantially expanded during 1951, is dependent upon completion of the vinyl monomer plant now under construction at Texas City. Units producing Ultron film will be expanded in 1952 to meet growing military and civilian requirements.

Present plant facilities at Springfield are adequate to accommodate the volume of phenol available in 1952. Larger moldings and new applications in the liquid varnish and foundry industries have maintained production of this plastic group at capacity levels. Alleviation of the phenol shortage would also move the Port Plastics plant into production of phenol-formaldehyde resins by mid-year.

Increased availability of melamine and urea in 1952 should stimulate activity in this field. Springfield plans include expanded capacity for resins for textiles, adhesives, laminates, and surface coating applications by early 1953.

Indirect increases in production of Vuepak (cellulose acetate) have resulted from process improvements effected this year. These improvements should mature in 1952. Nitron (cellulose nitrate) production is expected to continue at 1951 levels.

Pittsburgh Plate Glass Co.—A new plant is planned adjacent to the company's paint manufacturing plant at Springdale, Pa., about 20 miles from Pittsburgh, for the manufacture of Selectron resins exclusively. The plant will more than double existing facilities for making Selectron and, in addition, will give a new shipping point to add to those already existing at Milwaukee and Los Angeles.

The new plant is expected to be in production by mid-February.

Reichhold Chemicals, Inc.—Phenol production at the Tuscaloosa, Ala., plant will be increased by 50% as soon as it is possible to increase facilities to this extent.

At the Detroit plant, the addition of new kettles early in 1952 will result in at least a 25% increase in production of phenolic and urea resins. This is on top of a very large increase which took place in 1951.

The Elizabeth, N.J., plant is installing phenolic resin kettles which will enable them to handle production of Plyophens for laminating and impregnating purposes and also urea resins for the plywood and paper industries. The facilities at Elizabeth should be ready sometime during 1952.

The Tuscaloosa, Ala., plant is just completing facilities which will enable it to produce phenolic and urea resins for the plastics, plywood, and paper industries.

The Charlotte, N.C., plant is also completing facilities for the production of resins mentioned above.

The San Francisco, Calif., plant will have its capacity increased by 150% and the Azusa, Calif., plant will also have a much larger production capacity when present plans are completed early in 1952.

At Montreal, Quebec, a resin plant is now going up which will be completed early in 1952 and which will have facilities for producing very large quantities of phenolic and urea resins.

Rohm & Haas Co.—In contrast with the World War II situation, the company has been able, with the

(Continued on p. 174)

Machines for Thermoplastics

Injection Machines

DESPITE shortages in plastics materials in early 1951 and the metal shortage which grew more serious in the late months, machinery manufacturers reported sales and delivery in the United States of 568 injection machines in 1951, of which 381 were 3-oz. or larger and 187 were 2½-oz. or smaller. These totals compare with 690 machines of 3-oz. or larger sizes and 181 of 2½-oz. or smaller in 1950. Largest volume year on record was 1946 when about 1300 machines, 3-oz. or over, were delivered.

Foreign shipments totaled 165, of which 30 were 2½-oz. or less, but the majority were from 4- to 16-oz., with a half dozen or so ranging from 32- to 60-ounce.

Orders for new machines declined in 1951 from 1950 for various reasons. Several machinery companies switched over a large portion of their facilities to machine tools and other projects for the defense program. They had less time or space for producing injection machines. Molders were more cautious about ordering new machines because of the prevailing uncertainty in late 1950 and early 1951 about the availability of polystyrene. This latter factor was especially important to those molders who had planned to order 60-oz. or over machines.

Most of the big 200- and 300-oz. machines were planned for projects that required two or three years to develop, and those plans were temporarily shelved by material shortages. It is quite possible that those plans will now be revitalized and start another demand for big machines. It isn't so long ago that the practicality of 40- and 50-oz. thermoplastic pieces more or less startled the industry, but within 18 months after their introduction, they became commonplace. The same history may be repeated on 150-, 200-, or even 300-oz. pieces.

The machines delivered in 1951 were divided as follows according to size: 2½-oz. or less, 187; 3-, 4-, and 6-oz., 97; 8-, 9-, and 10-oz., 101; 12- and 16-oz., 96; 20-, 24-, and 28-oz., 6; 30-oz. and over, 39. Approximately 50 additional machines of 4-oz. and up were delivered but no separation by sizes was listed by reporting companies.

A trend is also noticeable to modify the 8- to 16-oz. machines to increase their present capacity by adding pre-plasticizing equipment and longer heating chambers. Thus, a machine that could consume 60 lb. per hour might be raised to 90. The number of machines so modified is still small, but growing.

Extrusion Machines

PRODUCERS of extrusion machines for plastics delivered approximately 455[1] machines varying size from 1¼ in. to 6 in. in 1951 in the United States. The 1950 figure was approximately 290. In addition to the 455 mentioned above, there were a score or more 1-in. machines and five 8-in. machines. Increased activity in the wire coating field is thought to be responsible for the increase over 1950.

The machines were divided into sizes as follows: 1¼- to 1½-in. bore, 38; 2- to 3¾-in., 329; 4½- to 4¾-in., 57; 6-in., 29.

In addition to the above machines, about 150 of various sizes, mainly 1¼- to 2-in., were exported.

It is always difficult to give an accurate estimate for extruders in use since so many are used full time or part time for other products than plastics and many others are used chiefly as compounding machines. Since this survey is primarily to show the number of machines actually working on extruded plastics products, an effort has been made to exclude as many compounding machines or non-plastic extruders as possible. However, no amount of searching except a personal survey of every plant in the country could produce the exact answer to this problem, so we have done the best screening job possible. Only those multiple screw machines used to produce extruded parts are included in these figures.

[1] A small number of exported machines may be in this total, but certainly less than ten.

Table I—Estimated Number of Machines in the Thermoplastic Molding and Extrusion Industry*

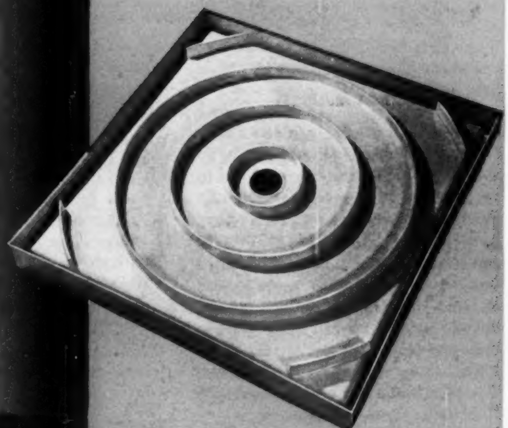
	1944	*1949*	*1950*	*1951*
Injection[a]	1400	3966	4654	5035
Extrusion[b]	—	1987	2205	2660

* There are no foreign shipments included in these figures.
[a] Exclusive of machines under 3-oz. capacity, 1951 figures for which are listed in box shown at top of this page.
[b] Does not include 1-in. bench extruders nor machines with bore larger than 6 inches.

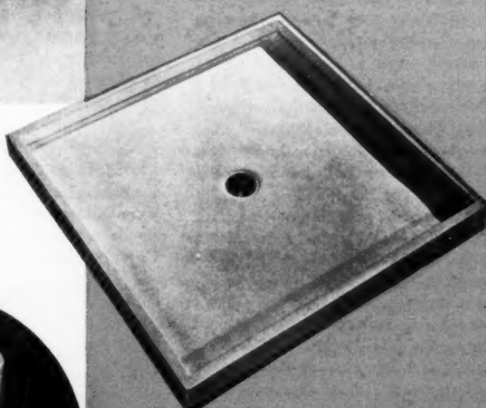
Plastics

Photos this page courtesy American Cyanamid Co.

Reinforced plastic shower stall bases or receptacles are available in a range of colors, never need painting or refinishing



Under side of shower stall receptacle shows method of providing adequate reinforcement



Upper surface of receptacle has a molded-in matte surface which promotes safety by preventing slips

New shower head housing is molded of grey melamine material, is resistant to heat and water. Housing screws to metal internal parts, adds a touch of warmth and color to the conventional chromium plating

in the Bathroom

EVER since the first plastics application for the bathroom—the wooden toilet seat covered with nitrate sheet—made its appearance about 20 years ago, plastics manufacturers have kept a collective eye on that room as a place where large volumes of plastics materials can be put to practical use.

Several recently developed bathroom applications make use of four different plastics and attest to the versatility and adaptability of the materials. These applications include urea sink escutcheons, acetate faucet handles, melamine shower head housings, and reinforced polyester shower stall base receptacles.

Escutcheons and Handles

The sink escutcheons and faucet handles are used in various combinations in fixtures assembled by several suppliers for Sears, Roebuck & Co. The parts are molded by Plastic Masters, Inc., New Buffalo, Mich. The escutcheons are produced in grey urea in three sizes—4 in. for lavatories, 6 in. for sinks, and 6 in. for tubs. All three plastic parts are compression molded in separate operations on a 150-ton Lawtomatic press. The urea is supplied by American Cyanamid Co. and Plaskon Div., Libbey-Owens-Ford Glass Co.

Holes are molded in all of the escutcheons to accommodate the faucets and spouts. Flanged rings, molded of acetate, are provided to hide the threaded section of the faucet.

Matching the escutcheons in color, the acetate faucet handles, also in three sizes, are molded around a die-cast insert which is included to provide additional strength to withstand the torque which is applied in use. Each of the three handle molds have eight cavities and are run on 12- and 20-oz. Lester-Phoenix injection machines, using cellulose acetate supplied by Tennessee Eastman Co.

At the Sears-Roebuck Merchandise Testing and Development Laboratory in Chicago, the escutcheons and faucet handles were exposed to, and withstood, test runs of all the hazards and abuse which they would be likely to encounter in use. Chemically inert, the materials are not affected by common solvents, greases, and food acids. In addition, the molded parts are easily cleaned and easy to keep clean.

Shower Head Housing

The shower head housing, molded of heat- and water-resistant melamine supplied by American Cyanamid, is assembled with metal parts to make a rotatable unit that directs the flow of water. Dickten & Masch Mfg. Co., Milwaukee, Wis., compression molds the plastic component for Milwaukee Flush Valve Co. in a 12-cavity straight mold at 285° F. under 50 tons pressure. Cure time for this molding operation is 1¾ minutes.

Reinforced Polyester Receptor

New in conception and design is the reinforced plastic shower stall base or receptor introduced to the retail market under the trade name of Tuf-Lite. The manufacturer, Kaytel, Inc., New York, N.Y., claims that this receptor offers the following features which have never before been combined into one model:

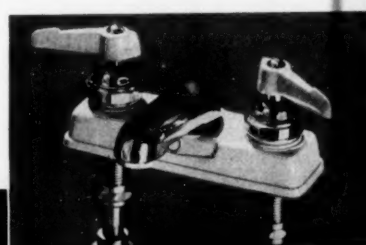
1) It is light in weight, thus facilitating shipping, handling, and installing. Weight of the Tuf-Lite receptor—20 lb.—compares very favorably with 350 lb. for terrazo and 80 lb. for steel receptors.

2) It is permanently leak-free because of its one-piece, seamless construction, and is more simple to install than other receptors.

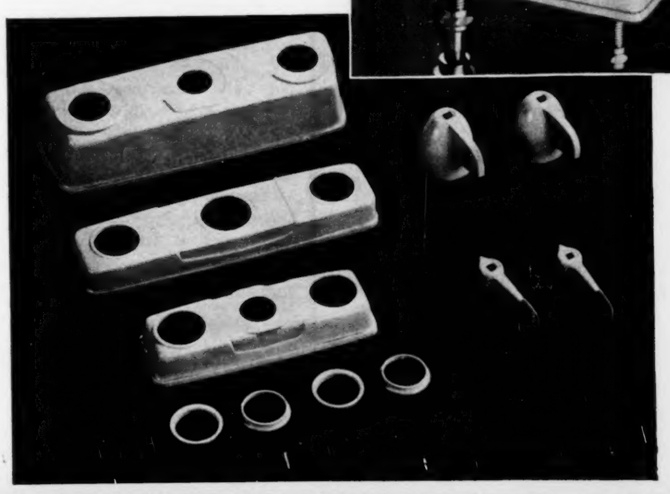
3) It promotes safety in the home because a simulated basket-weave design molded-in to the matte surface insures against skidding accidents.

The receptors are available in a range of colors. Because these colors are molded-through from surface to surface, the receptors never need painting or refinishing. They will not crack, chip, peel, or rust. The surface of the reinforced plastic is comfortably warm to the feet and, in addition, the material has certain sound-absorbing qualities that give the item a low noise rating under the force of the shower spray.

Molding of the Tuf-Lite receptor is done for Kaytel by Molded Reinforced Plastics, Inc., Ashtabula, Ohio, using American Cyanamid Laminac polyester resin reinforced with Owens-Corning Fiberglas.



Below: Sink escutcheons are molded of urea; flanged washers and faucet handles are of acetate. Right: Assembly of escutcheon, washers, and handles



Molds Can Be Had

Nation-wide survey of tool industry reveals that mold making facilities are available in all parts of the country

by EDMUND D. KENNEDY*

LOOSE talk about tool scarcities has cast a shadow over favorable consideration of plastics by many manufacturers. To find and publish the truth of the tool situation, a nation-wide survey of the tool industry was recently undertaken.

Granted, there has been a tightening up in tool making facilities. The nation's economic machinery, producing record outputs of consumer goods and at the same time stepping up defense production, placed a straining demand on the country's tool industry in mid-'51. Many tool shops were beginning to feel the growing pressure of defense orders, and were suddenly also inundated with orders for new style changes by hard goods manufacturers who were accelerating model changes to shore up their then sagging markets.

But first things had to come first. To reserve a better share of tool capacity in the United States for defense production, the NPA, in November 1951, issued a directive prohibiting major model changes requiring extensive retooling by automobile, large appliance, and many other consumer goods manufacturers. Details of the regulations restricting tool making are changing every day and will probably continue to change. The intentions and broad policies, however, are beginning to be clear. "Artificial obsolescence" of models—changes made simply for the sake of change—will definitely be frowned upon; sensible functional changes in the interest of production efficiency, real performance benefit, or the elimination of "bugs" in models will be sanctioned; and changes resulting in savings of the more critical materials will be encouraged.

Picture is Encouraging

Now, what's the picture of availability of mold making facilities? For one thing, it's a lot more encouraging than many plastics people think. Over 50% of the tool companies surveyed indicated that they could take on new business immediately, with deliveries ranging from about ten to fourteen weeks! This good news, coming directly from mold making resources, should serve to lay low any rumors about a total tie-up of mold making facilities and equipment.

Tool making is going on at a good clip today. Always a reasonably reliable barometer of tomorrow's business, it indicates a brisk period ahead. There will be plenty of molds in use, and that means a good level of business for plastic molding.

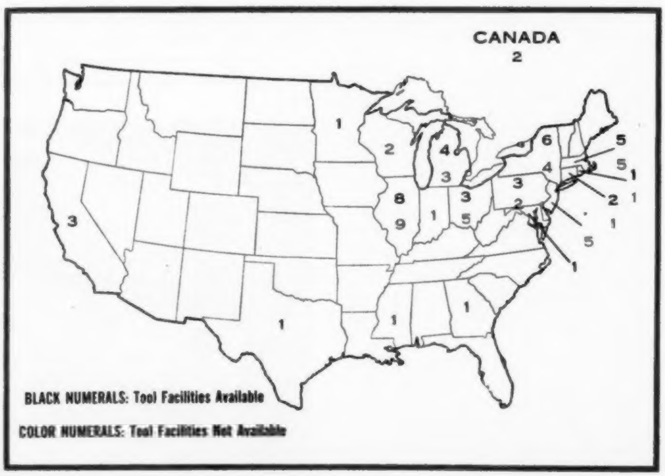
As the accompanying map-chart shows, open facilities were reported by the tool industry in all parts of the country, even in areas where the tool and die situation was classified as critical. In the heavily industrialized Chicago area, three mold makers said "yes" when asked if they were in a position to take on new business immediately, even though six others reported that they were booked solid. The picture is far better in the East Central section of the country; New England and New York fall just about in the middle.

In all, only seven tool firms reported that lack of mold metal was keeping them from taking on more jobs. The big majority said that with the exception of special alloys like beryllium copper, there seemed to be enough good quality hot-rolled and stainless steel stock to go around.

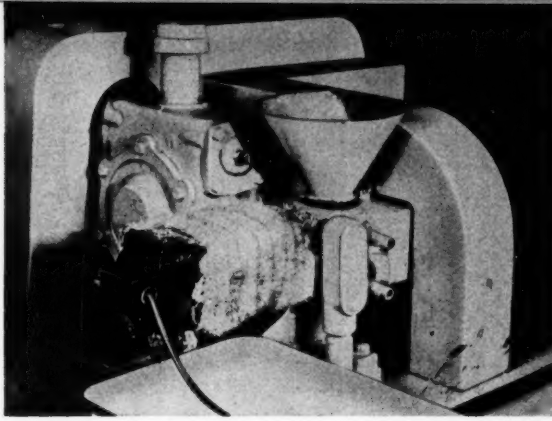
Of particular concern to the tool industry's management was the lack of skilled labor. Opinion was divided as to when and how this problem could be licked. Those who felt that it would persist as long as production continued at its present level pointed out that such manpower can't be developed overnight;

(*Continued on p.* 181)

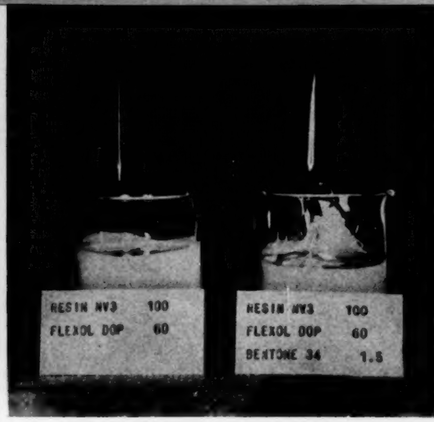
Mailing list for tool facilities survey included 270 tool firms. Of these, 48 reported that they could take on new business immediately and 39 said they could not. The geographical distribution of these firms is shown above. Of the 270 total, 25 were out of the tool business; return on the survey questionnaire was therefore 42 percent



* Manager, Advertising and Sales Promotion, Monsanto Chemical Co., Plastics Div.



Plastigel tubing emerges from a laboratory extruder directly into a liquid bath. Hot non-solvent liquids are recommended for fusing extruded plastigels



Film produced by dipping is thin in the case of plasticized resin (left); is much thicker when gelling agent is added

And Now The 'Plastigels'

by RICHARD W. QUARLES, EDWARD T. SEVERS, ARTHUR C. FRECHTLING, AND HUGH S. CARPENTER*

ORGANIC liquids can be converted to gels by the addition of various thickening agents, such as metallic soaps. When these thickening agents are added to vinyl resin plastisols, the latter are converted to putty-like substances which have been given the name of "plastigels."

Plastigels may be extruded, calendered, molded, spread, embossed, or otherwise manipulated at room temperature under pressures that are not much above the pressures used for processing ordinary plastisols. Formed plastigels retain shape and detail during fusion at temperatures of 300 to 400° F.

As an example of the retention of detail, a sound recording was stamped into a plastigel. After fusion *out of contact with the mold surface,* the plastigel stamping was found to have picked up and retained the groove pattern with sufficient fidelity to play a recognizable tune on a phonograph.

Application of Plastigels

Plastigels may be handled by many of the conventional methods of fabricating plastics but the pressures required are lower, leading to lower machine and mold costs. Extrusion is one process particularly well adapted to plastigels. The pressures required for extrusion of plastigels are but a small fraction of those required for hot processing of vinyls. Die design is not difficult since, under the low pressures used, there is little distortion in the extruded shapes. High speeds can be achieved because the products have sufficient cohesion so that they may be fused subsequent to extrusion.

Thick wall plastigel tubing of small diameter, as well as sheeting, has been extruded and subsequently cured by festooning in an oven without measurable distortion. Extrusion into a hot bath has proved even more desirable because of the supporting effect of the liquid and the faster heat transfer.

Plastigel tubing has been successfully fabricated with a low pressure rubber extruder. It is probable that machinery designed for the extrusion of clay or ceramic products can be readily adapted to fabricating plastigels into pipe, tile, and similar products.

Embossing of unfused plastigels is a relatively easy process since only low pressure at room temperature is required. In the laboratory, fabrics have been used to emboss sheeting under low pressures. Moisture on the fabric serves as an excellent release medium and imprints are maintained with good fidelity during the fusion process.

Calendering of plastigels under low pressures is feasible for coating cloth, paper, felt, and similar materials or for preparing unsupported sheets. The products are fused after calendering.

Molding and stamping offer promise as simple methods of fabricating plastigels. Very fast cycles are possible since the objects merely need to be formed in the mold and may be fused in a subsequent operation. Delicate inserts are not disturbed because only low pressures are required.

Unlimited Color Range

Compounds suitable for hand modeling have been made in an unlimited range of colors. Products range from a Shore A hardness of 100 to very soft. Filled compounds have much the same working characteristics as ordinary modeling clay, but with the advantage that they may be cured at temperatures available in a domestic oven. Mod-

* Union Carbide and Carbon Corp. Fellowship, Mellon Institute, Pittsburgh, Pa.

Low pressure molding characteristic of plastigel is demonstrated by forcing the soft material into a mold by hand. The mold halves are of cured plastigel

After the assembled mold has been removed from the curing oven, the flexible halves are readily stripped off

els, flexible molds, tool handles, and orthopedic and prosthetic appliances are a few of the objects that have been modeled from plastigels. The low density and non-shattering property of plastigels suggest that they may replace ceramics for equipment to resist inorganic acids and alkalies at room temperature. Caulking compounds and tailor-made gaskets which may be fused in place are other possibilities.

Since only low pressures are required to form plastigels, they can be applied as potting compounds for protecting coils and intricate electrical connections without disturbing delicate connections. Flexibility and low shrinkage during curing are valuable properties in this type of application.

Low Viscosity

Spreading on cloth or paper at high speed requires products of relatively low viscosity. Plastigels thinned with volatile diluents spread readily and after the mild drying required to evaporate the diluents regain their plastigel properties. Thus, plastigel coated products may be rolled, embossed, or otherwise handled before fusion if desired. Advantage can be taken of the control of flow offered by the plastigels to coat open-weave cloth or to prevent penetration of coatings into porous surfaces.

Heavy but uniform dip coatings are feasible with plastigels. It is not necessary to preheat the object before dipping to prevent sagging and dripping. Wire and cordage may be uniformly dip coated; even heavy spray coatings can be more readily controlled with gelling agents than by the evaporation of volatile diluents.

Preparation of Plastigels

The preparation of plastigels from vinyl dispersion resins involves only minor modification of the familiar plastisol techniques. Plastisols are prepared in the conventional manner[1], and the incorporation of a gelling agent is the only additional step.

Plastigels using Vinylite resin VYNV.2 are prepared by mixing resin, plasticizers, fillers, colorants, and stabilizers to form a paste. The crude dispersion must be refined by grinding, usually on a 3-roll paint mill. Up to this point, the procedure is identical with the preparation of a plastisol. The one additional step is the conversion of the paste to a plastigel by addition of a gelling agent in a dough or pony mixer.

The exact proportion of gelling agent will vary with the composition and the method chosen for fabrication. The concentration is easily determined by experiment but will generally fall in the range of 2 to 10% of the weight of the plastisol.

Effect of Plasticizer

The proportion and type of plasticizer play an important part in the formulation of plastigels. Those containing large proportions of plasticizer require larger proportions of gelling agent to prevent flow during fusion. Plasticizers differ in their tendency to thicken upon the addition of each gelling agent. Varying the concentration of gelling agent to counterbalance the effect of plasticizer is the key to a successful formulation.

Many gelling agents have been successfully used in the preparation of plastigels. Some of those which have been most useful with the common vinyl plasticizers are the following:

Soaps:
- Aluminum laurate
- Aluminum di-2-ethylhexanoate
- Aluminum stearate
- Magnesium stearate
- Napalm

Colloidal silica:
- Santocel C

Organophilic bentonites:
- Bentone 18
- Bentone 34

The use of Vinylite resin QYNV simplifies the procedure by allowing the entire operation to be carried out in the same mixer. In this case, pigments should be well dispersed in a portion of the plasticizer to develop their full color intensity and to prevent streaking. Gelling agents should be added at the end of the mixing operation.

Bentone 34[2,3] or Santocel C may be added directly to a mixed plastisol but the soaps are more efficient if they are dissolved or dispersed in a portion of the plasticizer at elevated temperatures.

Fillers—Fillers are widely used in vinyl compounds to decrease cost

[1] Quarles, R. W., and Powell, G. M., Vinylite Dispersion Coatings. Bakelite Co., New York, N.Y.

[2] Jordan, J. W., J. Phys. and Colloid Chem. *53*, p. 294, (1949).

[3] Jordan, J. W., Hook and Finlayson, J. Phys. and Colloid Chem. *54*, 1196, (1950).

Elements of experimental plastigel molding operation illustrated opposite. Model and cured replica are at upper left; plastigel mold halves are at lower right

and to improve dryness of the surface where the ultimate in flexibility and tensile strength is not required. Plastigels may likewise be filled. Small additions of fillers such as York Whiting considerably decrease the flow under load. Concentrations above 50% of the resin weight exert relatively little additional thickening action.

For compositions such as flooring, as much as 300 parts of filler to 100 parts of resin and 70 parts of plasticizer have been successfully handled.

Many fillers and pigments exert a moderate thickening action. Copper phthalocyanine pigments and finely divided silica are examples of materials that are capable of bodying plasticizers. Thereby they decrease the amount of gelling agent required to formulate a plastigel.

Mobility of Plastigels

Freshly prepared plastigels are more mobile than those which have aged undisturbed for about 24 hours. This is a decided advantage since less power is required to mix plastigels of high ultimate consistency. This change in consistency is thixotropic (the property of becoming fluid when shaken and regelling upon standing) in nature. Hence the mobility may be regained by subsequent agitation.

Flow Properties

The flow properties of plastigels are easily demonstrated by manipulating a small lump of the material with the fingers. A slight finger pressure causes the material to deform, but when the pressure is removed elastic recovery takes place. If the applied force exceeds the yield value, flow occurs and the deformation is permanent. Once flow has started, very little additional pressure is required to increase the rate of flow. This is typical of plastic and pseudo-plastic materials; the apparent viscosity decreases as the rate of shear increases.

When a lump of plastigel is kneaded for some time, the material becomes softer. After the kneading is stopped, the material regains stiffness with time until it approaches its original consistency. This is the evidence of thixotropic breakdown of the gel structure and its subsequent regelling.

The measurement of the flow properties of plastigels is important in their formulation and use. Two methods of study have been found useful in this work.

The flow properties of the thicker putties are followed quantitatively by measuring the spread of a standard cylinder of material when compressed under various loads according to the method described by Gardner and Sward[4]. The diameter of spread is greatest for the softest putties. Materials with a yield value flatten under the load and then cease flowing; hence this test is a measure of the yield value. Different loadings will produce different amounts of thixotropic breakdown in plastigels and consequently different yield values.

[4] Gardner and Sward, "Physical and Chemical Examination of Paints, Varnishes, Lacquers and Colors," p. 320, Henry A. Gardner Laboratories, Inc., Bethesda, Md. (1946).

Many applications using plastigels demand a knowledge of their flow properties at higher rates of shear than can be measured by pressing between glass[4]. A device for measuring the flow properties of plastigels over wide ranges of rates of shear is the extrusion rheometer, in which the plastigel is forced through a cylindrical orifice by pneumatic pressure and a flow curve may be obtained by measuring the rate of flow at a series of pressures.

A plot of pressure drop versus volumetric flow rate describes the flow properties of a plastigel flowing through a given orifice and is adequate for plant control and formulation studies.

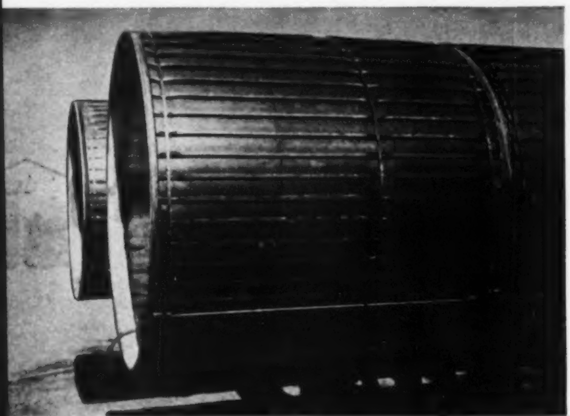
Fusion of Plastigels

Plastigels, like plastisols, require fusion at 300 to 400° F. to obtain maximum strength. This is not a chemical reaction but is a mere solvation of the resin by the plasticizer. Therefore, the duration of the bake need only be long enough to permit heat transfer to the interior of the object. Various methods of heating may be used for the fusion. For example, circulating air or infra-red ovens such as are now used for fusing plastisols are equally satisfactory for plastigels. Baths containing hot non-solvent liquids are particularly useful for fusing extruded plastigels. Not only are baths convenient and rapid heat transfer media, but the buoyant effect of the liquid permits the handling of plastigels too soft for baking in air. These baths may extract plasticizer from the product but this can be prevented by adding an equilibrium amount of plasticizer to the bath. An excess of plasticizer in the bath may cause absorption of the plasticizer in the surface layers of plastigel. This may improve the surface gloss but sometimes develops surface tackiness.

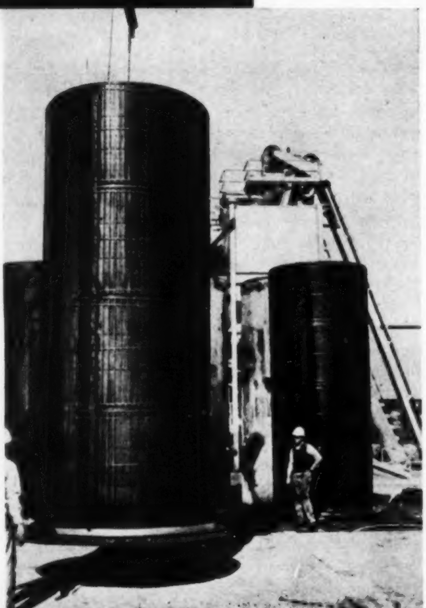
Plastigels furnish another method of using the versatile vinyl chloride resins in a dispersion form. The fact that dispersions are processed on simple equipment means that relatively little capital outlay is required to start production. Thus, plastigels offer an economical means of producing molded, embossed, and dipped plastic products.

Bakelite Co. furnishes only the Vinylite dispersion resins which are used to compound plastigels.

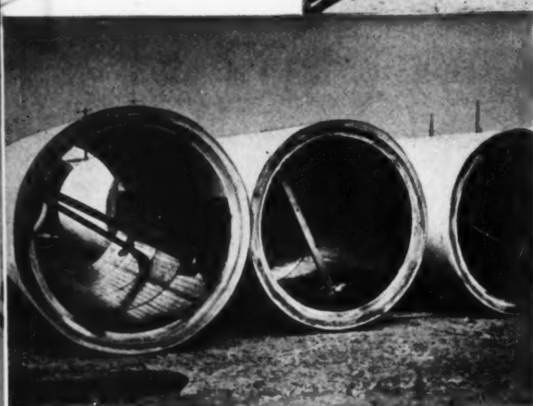
Protection for



Molded vinyl pipe lining is clamped in place on a form. When concrete is poured for pipe, T-shaped extensions on back of lining are imbedded, forming an inseparable bond



Huge section of pipe lining is shown upright after the sheets have been welded together with a hot air torch. Sheets are up to 4 by 8 ft. in area and are at least 0.060 in. thick



Finished sections of 78-in. pipe are two thirds lined with vinyl because only gas area above the water needs the protective lining

HYDROGEN sulfide—the evil smelling gas that distinguishes rotten eggs—is strong and objectionable in more ways than one. For example, it can cause disintegration of concrete, one of the most durable of all building materials.

This is a serious problem in the concrete sewer pipe business because some types of sewage give off hydrogen sulfide in large quantities. The problem led Amercoat Corp., South Gate, Calif., into a 15-year development program on protective coatings, and out of that work came T-Lock Amer-Plate, a vinyl plastic sheet liner made from B. F. Goodrich Chemical Co.'s Geon resin. The new liner, now thoroughly tested, is being used in a pipe line nearly seven miles long and from 39 to 78 in. in diameter in Orange County, Calif. The big sewer will need about 400,000 sq. ft. of liner.

Before Amer-Plate was developed, many systems had been tried for protecting concrete pipe from the action of hydrogen sulfide as well as corrosive acid-laden industrial wastes. For instance, tile linings were often used where service conditions were severe, but this was never completely successful because corrosion would start at the tile joints and finally push the tile from the concrete surface.

When Amercoat Corp. started its research work on the problem, it laid down nine requirements which the ideal liner had to meet:

1) It should be a continuous lining at least over the entire length of each pipe section to which it is applied.

2) It must be unaffected by either bacteria or fungus attack.

3) It must be impervious to gas penetration, especially to hydrogen sulfide.

4) It must be inert to a wide variety of chemicals, including acids, alkalies, salts, oils, and greases.

5) It must be unaffected by continuous exposure to high humidity and to flowing water.

6) It must not be affected by oxidation or by aging under the above conditions.

7) It should have some flexibility so as to have resistance to the check-

Sewer Pipes

Molded vinyl sheet, as protective liner, is mechanically locked into poured concrete pipe; joints are welded with hot-air torch

ing of the concrete and to minor cracks and settling of the structure due to earth changes after the line is in place.

8) It should have sufficient thickness to withstand abrasion incurred during installation and operation.

9) It should have extremely high adhesion to the concrete surface or it must be mechanically locked into concrete as part of the structure.

Hundreds of Tests

Literally hundreds of protective coating materials were tested. As early as 1938, interest was centered on polyvinyl chloride because of its extreme resistance to water, gases, and most chemicals. Also, being thermoplastic, the vinyl material could be heat sealed, or welded, to give gas-tight, water-tight joints. By proper compounding of the vinyl resin with inert pigments to increase density and strength and to reduce penetration, an extremely impervious plate-like lining was developed which met all theoretical requirements of the application.

Amer-Plate — the product that emerged from the development program—is supplied in sheet form. The sheets are 0.060-in. in minimum thickness and up to 4 by 8 ft. in area. Individual sheets are welded together to make liners for any size or length of pipe. The surface of the liner is smooth to reduce friction.

As a dramatic demonstration of the extreme chemical resistance of the liner, Amercoat Corp. picked a group of 30 chemicals commonly found in industrial wastes and exposed Amer-Plate to them continuously for over two years. None had any effect on the properties of the plastic. The chemicals used in the test ranged from tap water to various concentrations of a number of acids, from soap solutions to ammonia, from gasoline to chlorine, from peanut oil to ethanol, etc.

Locked to Concrete

The T-Lock Amer-Plate liner is molded from Geon vinyl plastic compound with T-shaped extensions protruding from its reverse side. These lock the liner to the pipe when the concrete is poured, thus making the plastic an integral part of the structure.

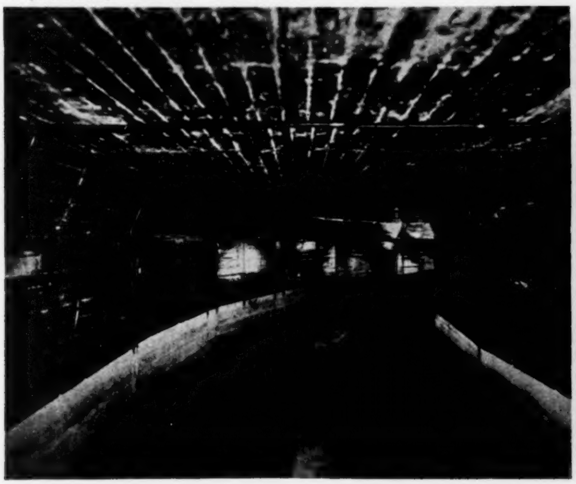
A hot air torch is used in welding the joints between Amer-Plate sections. The plastic is brought to a temperature of 300 to 325° F. for the operation. A welding strip, slightly softer than the Amer-Plate itself, is applied over the butt joints as a seal.

The first commercial installation of Amer-Plate was in the San Diego area in 1947. It was put in as a lining on numerous pipe and structure jobs by the City of Los Angeles. The United States Engineers specified Amer-Plate for lining several hundred feet of 42-in. full-lined reinforced concrete pipe. The plastic liner plate has also been used successfully in jet chambers, gaging chambers, ferric chloride mixing tanks, and numerous other structures requiring surface protection.

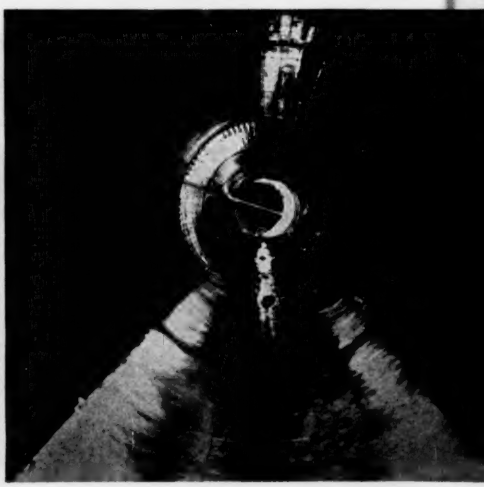
T-Lock Amer-Plate is fully protected by United States Patents, both issued and pending.

Interior of monolithic poured box structure, part of Los Angeles sewer system, is lined on top and sides with vinyl to protect it from corrosive liquids and fumes

All photos courtesy B. F. Goodrich Chemical Co.



Interior view of three-quarters lined 78-in. pipe in 7-mile long installation using 400,000 sq. ft. of vinyl lining



Blade of acetate-handled windshield scraper has soft rubber side so that the tool can be used to wipe water, steam, or fog from windows

Blade with phenolic laminate scraper side and natural rubber squeegee side is molded-in to black acetate handle. The blade is 3 in. long

Windshield Scraper Does Two Jobs

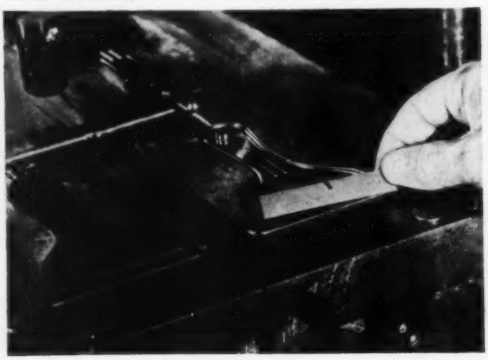
An unusual combination of materials—cellulose acetate, phenolic laminate, and rubber—is used in the Squeegee-Scraper made by Tweco Products Co., Wichita, Kan. The acetate-handled tool has a blade with a phenolic laminate side for scraping ice from windshields and a rubber side for wiping off water, fog, or mist.

The blade of the Squeegee-Scraper is made of 1/16-in. natural color Grade C phenolic laminate with a layer of 1/32-in. red natural rubber bonded to one side of it. The composite blade stock is furnished by Synthane Corp., Oaks, Pa., in 36 by 36 in. sheets with the rubber bonded to the plastic in a laminating press. The adhesive used is regular phenolic laminating resin, which is coated on the rubber sheet prior to the lamination process.

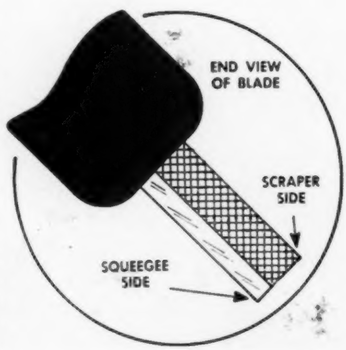
The sheets are cut into blades 3 in. by 5/8 in., and a notch 1/4-in. long is cut into the center of one of the long sides of each blade at an angle to that side. The blade is then utilized as an insert to be put in the handle mold.

The scrapers are molded for Tweco by The Haas Corp., Mendon, Mich. They are molded of black Tenite I in a two-cavity mold in a vertical injection machine. The blades are hand-loaded into the cavities; during molding the acetate flows into each notch, thus effectively locking the blade in place.

Courtesy The Haas Corp.



Phenolic laminate side of blade is 1/16 in. thick. Rubber sheet 1/32 in. thick is bonded to the plastic in laminating press



Blade is loaded into mold cavity as an insert. Acetate flows into notch in blade, locking it in place

'Plastics Horizons'

Advance program of the Eighth Annual National Technical Conference of the S.P.E., to be held in Chicago during January

THE vital role of plastics in our present national economy, both civilian and military, will be highlighted at the Eighth Annual National Technical Conference of the Society of Plastics Engineers, Inc., to be held at the Edgewater Beach Hotel, Chicago, on January 16, 17, and 18. Theme of the conference, which will be sponsored by the Chicago Section of S.P.E., is "Plastics Horizons." Among the features of the program will be a symposium on military applications of plastics and reading of winning papers in the annual S.P.E. prize paper contest. Morning and afternoon technical sessions will be augmented by other program features, including luncheon and banquet meetings and an entertainment program for ladies attending the conference.

John T. Bent, Tennessee Eastman Co., is general chairman of the conference, assisted by R. K. Gossett, Gossett & Hill Co., as co-chairman. M. A. Self, Bee Chemical Co., is secretary, and Charles Schiff, Breyer Molding Co., treasurer. Committee chairmen include Stanley F. Peters, Monsanto Chemical Co., program; Tom H. Cleavenger, Koppers Co., Inc., speakers; and Ned Porte, General American Transportation Corp., publicity.

Companies wishing to have official representation at the conference should contact the chairman of company registration, Robert S. Stephens, Sobenite, Inc., 7720 N. Sheridan Rd., Chicago, Ill. Registration fees are $5.00 each for members, $7.50 for non-members, and $2.00 for ladies. Tickets for the luncheon will be $3.00 and the charge for the banquet will be $6.00 per plate.

It is planned to present abstracts of the Conference papers in the February 1952 issue of MODERN PLASTICS. The complete advance program, as furnished by S.P.E., is given on this page.

Wednesday, Jan. 16

2:00-3:15—S.P.E. educational forum. Chairman—Dr. James M. Church, Columbia University. Speakers—Dr. Louis F. Rahm, Princeton University; J. Harry DuBois, Plax Corp.; J. W. Lindau III, University of South Carolina; E. S. Bloom, E. I. du Pont de Nemours & Co., Inc.

3:30-4:45—Chairman, Wm. K. Woodruff, Celanese Corp. "Plasticel Archeology," Dr. Johan Bjorksten, Bjorksten Laboratories, and Dr. Edwin L. Gustus.

3:30-4:45—Chairman, D. S. Plume, Rohm & Haas Co. "Extrusion of Large Piping," E. C. Blackard, Tennessee Eastman Co.

Thursday, Jan. 17

Morning Session

9:15-10:30—Chairman—Alex J. Malashevitz, Catalin Corp. "A.S.T.M. Standards and Their Effect on Plastics Technology," Robert Burns, Bell Telephone Laboratories, Inc.

10:45-12:00—Chairman, Edward Borro, Sr., Durez Plastics & Chemicals, Inc. "Modified Phenolics," Dr. Wyman Goss, General Electric Co. "Stress Gremlins in Thermosetting Plastics," H. M. Quackenbos, Jr., Bakelite Co.

10:45-12:00—Chairman, M. Colburn Bailey, Koppers Co., Inc., "Molding of Thick Sections," Gordon Thayer, Dow Chemical Co.

Afternoon Session

1:30-3:00—Chairman, A. J. Wiltshire, Apex Electric Mfg. Co. Reinforced Plastics Panel Discussion.

1:30-3:00—Chairman, Roman C. Brotz, Plastics Engineering Co. "Preplasticizers," R. W. Powell, The Hydraulic Press Mfg. Co.

3:15-4:30—Chairman, Sherwood L. Young, C. F. Church Co. Presentation of prize winning papers.

6:00—Annual Banquet. Speaker, Maj. Gen. GSC Ward H. Maris, Deputy Assistant Chief of Staff, G-4.

Friday, Jan. 18

Morning Session

9:15-10:30—Chairman, Carl F. Massopust, General American Transportation Corp. Panel Discussion on Mold Design. Wayne I. Pribble, Barrier-Pribble & Co., Inc.; Victor G. Reiling, Kurz-Kasch, Inc.; Edward F. Borro, Durez Plastics & Chemicals, Inc.; W. P. Gabrelli, Nash-Kelvinator; W. G. Harvey, Guy P. Harvey & Son Corp.

9:15-10:30—Chairman, Warren F. Cooper, Tennessee Eastman Co. "High Impact Styrenes and Copolymers," Dr. Paul Elliott, Naugatuck Chemical Co.

10:45-12:00—Chairman, Gene O. Reinecke. Panel discussion on New Applications and Design of Plastics. Tom Muckenfuss, Radio Corp. of America; Wyn Cooper, Bakelite Co.; Eric Furholman, consultant; Jim Johnston, Chicago Molded Products Corp., and Jack Davis.

12:00—Luncheon. Speaker, Dr. G. F. D'Alelio, Koppers Co., Inc. Meeting of members of the Society and the introduction of new national officers.

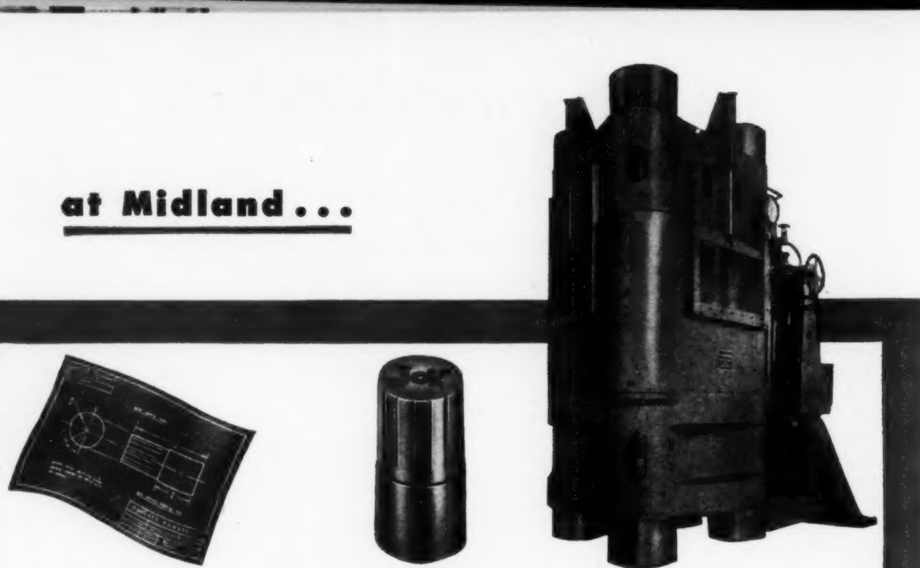
Afternoon Session

2:00-3:15—Chairman, Edmund S. Childs, Monsanto Chemical Co. "Extrusion of Vinyl Film," A. M. Stover, Naugatuck Chemical Co.

2:00-3:15—Chairman, Philip Belk, Hercules Powder Co. "The Role of The Engineer in Sales," Edmund D. Kennedy, Monsanto Chemical Co., and Amos Ruddock, Dow Chemical Co.

3:30-4:45—Chairman, Ken Gossett, Gossett & Hill Co. Symposium on Military Applications (Research).

at Midland . . .



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F. B. Stanley, Engineering Editor

Engineering Progress in 1951

THE MOST startling advances of all time would have occurred in the Plastics Industry in 1951, but there were two wars: the Korean and the cold.

In spite of the resulting economic upheaval, it is encouraging to note that no ground was lost. Plastics came to the aid of many manufacturers who, because of the scarcity of metals, were faced with complete shut-down. The vast majority of these conversions were excellent, as exemplified by the Lewyt vacuum cleaner job ("Lewyt Turns to Plastics," October 1951; and "Lighter Than Steel," December 1951 MODERN PLASTICS); in fact, when certain costs are reduced, most of the conversions will undoubtedly be permanent.

Plastics production for Armed Forces requirements has been slow in getting started, mainly because of the tremendous amount of new design and engineering which must be completed before production can begin. It is definitely gaining momentum, however, and there is no doubt that the year 1952 will see a quite sizable increase in this class of work.

In addition to the articles which are digested in this review, complete information on additional subjects was published in MODERN PLASTICS during 1951. In February—A complete description of mold design and operational procedures for molding eight styrene phonograph records per shot. In March—A description, including working drawings, for an automatic gate breaker for breaking gates in an injection mold. In April—A new static neutralizer utilizing the alpha rays emitted from plutonium.

Also in April—A "know-how" article on how to fabricate reinforced plastics, including many actual examples, giving technique, required tools, times, etc. In May—A treatise on designing and building matched molds for reinforced plastics, complete with detailed drawings. In July—A description of extrusion compounding as employed by a major material company for compounding, coloring, and pelletizing their cellulose acetate molding and extrusion materials. In October—A case history of the equipment and methods used for performing seven different machine and five different assembly operations on a molded melamine hearing aid frame.

And in December—The techniques used to mass-produce the dust-bowl for the Lewyt vacuum cleaner, using polyester resin and glass fiber filler.

ELECTROFORMING FOR PLASTICS

EXTENDED electroplating, a process known as electroforming, is an important tool for the plastics industry. Some molds for injection, some forms for postforming thermoplastic sheet, and most molds for slush molding are made by this process. The most extensive use of it, however, is for the production of spray masks or stencils which are used to protect certain areas of a plastic part while leaving the remaining surface free to be decorated with paints or lacquers. Stencil spraying results in uniform decorating jobs and may be accomplished at greater speeds and lower costs than hand painting. These advantages, however, can be realized only when properly designed and accurately fitting masks are used.

There are two general classifications of electroformed stencils—"blocked" and "unblocked."

Unblocked stencils are formed by plating directly over the molded part which thus serves as a matrix. With the exception of their open sections, these stencils are in intimate contact with all other surfaces of the part being decorated.

The blocked stencil is made to allow clearance between the stencil shell and certain surfaces of the part being decorated. A major advantage of a blocked stencil is that the plastic part can be inserted in and removed from the stencil with ease, thereby making for fast production. It is also possible by blocking to design a stencil for use with multi-color spraying so that the contact points of the stencil will not touch "wet paint" areas.

Both of these stencil types may embody other features such as bridging or baffling. Bridging is used when the sprayed detail completely surrounds an "island," as in the letter "O."

Baffling permits the use of a single stencil for applying more than

*Reg. U. S. Pat. Office

Photo courtesy Wm. M. Fiore, Inc.

Five different electroformed spray masks were required for complete decoration of doll's head (center). These masks are (clockwise from top center): white for the eyes; black for the pupils; red for the lips; blue for the retina; black for eyelashes and eyebrows

one color on an object. The baffles are actually partitions erected between openings to prevent a color from being applied to openings other than those for which it is intended.

A hinged stencil may be used when two sides of an object are to be sprayed with one insertion in the stencil. Although this type of mask appears to have the advantage of high speed production, experience has shown that faster and better work can usually be done with two separate stencils.

Inasmuch as electroformed stencils are made by plating directly on one of the molded parts, it is important that the plating be done on molded pieces which have been produced exactly as they will be in full scale production. If the mold is single cavity, only one set of masks will be required, but if there is more than one cavity in the mold and there is a possibility of the slightest variation in dimension from cavity to cavity it is generally necessary to produce a set of masks for each cavity. Sometimes it will be found that a portion of the cavities of a multi-cavity mold will produce exactly similar parts, while another portion makes parts different from the first but accurate one to the other.

The first step in the manufacture of a spray mask is to build up the blocking, a step which is eliminated when making unblocked masks. The "no contact" portions of the molded matrix are built up by applying either several coats of heavy lacquer or a layer of wax. If wax is used, sections are cut to size and shape from pattern-makers' wax.

The blocked or unblocked matrices are now mounted on a plating fixture. This entire assembly is then sensitized; that is, the surface is made electrically conductive.

After sensitizing, the plating fixture and mounted matrices are placed in a plating bath and connected to the source of plating current.

Electroplating is carried on in a copper plating bath until a copper shell approximately 0.050 in. in wall section has been built up on the entire outside surface of the matrix. This thickness will vary somewhat, with the depressed portions thinner than the raised areas.

After the plated matrices are separated from the plating fixture and the shell smoothed by sanding and/or filing, the matrices are taken out of the electroformed shells. For most thermoplastics this can be done by placing the shell under an infra-red lamp. Once the material has softened it should pull out easily from the stencil. If difficulty is encountered, the shell and matrix should be placed in an oven at approximately 600° F. for about 20 minutes. The bulk of the matrix material can then be removed and the balance dissolved with a solvent for the particular thermoplastic used.

It is nearly always necessary to provide a mounting plate for each spray mask. In one mounting method, the copper shell is soldered to an accurately cut opening in a suitable metal mounting plate. In another method, the mounting plate is built up in the plating bath.

Regardless of which method is used to produce the mask and mounting plate assembly, the next step is to carefully pierce or cut the shell to provide openings through which the paint will be applied.

In the manufacture of electroformed cavities for injection molding, it is generally best to use a metal master matrix. However, if high accuracy is not required, a

(Continued on p. 182)

SEAMS SEALED IN SECONDS

AN IDEAL setup for high speed, economical manufacture of a complete line of raincoats has been engineered by Mayflower Electronic Devices, Inc., West New York, N.J., and manufactured for Plastic Electronic Fabricators, Inc., Union City, N.J. This equipment is now in full-

scale operation on a regular production basis.

In this new production setup, the first operation is "cutting out the patterns." Multiple thicknesses of material—up to 400 layers of vinyl—are laid out on a long table. A paper pattern sheet of the same length and width as the vinyl sheeting is then placed on top of the stacked material. This pattern sheet carries drawn layouts for the various parts of the garment, arranged to minimize waste material.

A steel knife cutting machine, recently developed by H. Maiman Co., Inc., New York, N.Y., used to cut the multiple lay-up to pattern, generates so little frictional heat that no fusing of the cut edges occurs.

A total of 11 parts is required for a man's raincoat, 15 for a woman's.

First steps in the fabrication of either a man's or a woman's raincoat involve two heat-sealing operations to seal in two reinforcing strips to form the front facings of the coat; that is, the portions of the coat which include the buttons and the button-holes. Two operators pick up a 0.020-in. thick vinyl strip and fold one front edge of the bodice around it with a triple fold. This section of the garment is then located on correct position in the die. To start the automatic cycle of the press, two buttons must be pushed, one by each operator. The two-button control system is a standard set-up throughout the entire plant and was installed for purposes of safety.

The first heat sealing die is a special development which accomplishes not only the complete bonding of the three folded layers of the bodice and the reinforcing strip to each other, but also automatically produces the button-holes by what is known as the tear-seal method. This involves the bonding of the material at what will become the edges of the button-holes and, at the same time, the compressing of a line of the material at the button-hole location to a very thin wall. In a later operation, the button-holes are formed by tearing open this thin wall, an operation which is accomplished with only a small amount of pressure and which leaves a completely smooth and bonded edge, reinforced against further tearing.

Reinforcing of the second side of the front facing proceeds in a similar manner, except that instead of producing tear-seal button-holes, location marks are automatically made for the buttons.

Above: Straight bar sealer is used for two operations on collar of vinyl raincoat. Prefabricated collar is first basted on one side, then turned over and the raw edges bonded. Below: Rotary high-frequency sealer hems the raw edges of the bottom of a raincoat. Same machine is used to hem ends of sleeves. The die used in this sealer is so machined that the finished hem has the appearance of being sewed with thread

Two raglan sleeves are bonded to the body of the coat, and the parts are then sent to the two sleeve-closing machines. This operation bonds the two raw edges of the sleeve. It is performed while the sleeve is inside out, so that when the operation has been completed and the sleeve turned right side out, the raw edges of the material cannot be seen.

A highly specialized sealing unit is used to produce a three-ply tear-seal collar. Three thicknesses

of vinyl which have been cut to correct shape for the collar are laid in position in the lower portion of this special die. The upper portion of the die consists of two bars, one formed to the exact shape and size of the collar and the other an inner bar formed to the same shape but smaller in size. The inner bar is spring-loaded and the outer one fixed rigidly in position. As the die closes on the vinyl material, the action of the spring-loaded portion of the die is to produce a perfect bond about 0.25 in. in from the outside edge of the collar. The fixed portion of the die also produces a bond, but because it is designed to close further than the spring-loaded part, it squeezes or extrudes the material on the outer portion of the bond to a very thin wall. This makes it possible, once the bonded sections of vinyl are removed from the die, for the operator to quickly tear the excess scrap from the outer edge of the piece, leaving a completely finished collar.

The pre-cut pockets are then heat-sealed to the bodice of the coat. Location marks have previously been made on the bodice, so that the operator is able to locate the coat merely by means of these indicating points.

The partially finished coat next goes to a straight-bar sealer, which is used to assemble the prefabricated collar in place. Two heat sealing operations are performed on the collar in the same die. It is first "basted" on one side; then the collar is turned over and a second bonding operation seals the protruding raw edge of the collar, so that no subsequent trimming operation is required.

The in-process material is next taken to the button-sewing machines, which were specially designed by Singer to sew automatically either 2-hole or 4-hole buttons on the material.

Hemming the raw edges of the bottom of the coat and the ends of the sleeves is accomplished on a rotary high-frequency sealer with the die machined so that it produces a hem which looks as though it were sewed.

After final inspection, the coats are stacked on a large table, where operators skilled in the handling of vinyl material smooth them out and fold them into a compact bundle.

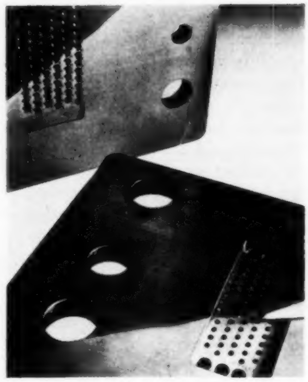
(Modern Plastics, November 1951, p. 97)

Cabinet-type blasting machine used to clean mold parts after heat treating

LIQUID IMPACT BLASTING

LIQUID blasting is a modified form of impact blasting in which an abrasive is suspended in a liquid, generally water, agitated to maintain suspension, and propelled through a blast gun by means of compressed air. The gun is sometimes housed in a cabinet. Since the abrasive is suspended in the liquid (which may contain a corrosion inhibitor), there is no limit to the fineness of the particles which can be used, but they are generally in the talcum powder range and finer.

In mold finishing, wet blasting is superior to dry blasting because: 1) fine dry abrasives tend to pack and flow unevenly; 2) fine dry abrasives naturally create dust, and effective control provision is required; and 3) surface finishes produced by fine dry abrasives are not as smooth as those produced by the same abrasives blasted in suspension with water and projected at the same pressures and volumes.



Liquid blasting removes heat treat scale from precision mold without damaging fine detail of engraving

Most liquid blasting uses the suction feed method or a modification of it in which the abrasive is fed to the blast gun at low pressure. The gun is manipulated in one hand so that the nozzle is within an inch or two of the work, and the abrasive stream strikes the work at an angle of between 60 and 90°. Flatter angles of abrasive impact can be used to reach recesses and awkward surfaces with corresponding sacrifices in polishing speed.

Liquid blasting is most generally adaptable in the tool room for the following uses: 1) removing and blending directional grinding lines; 2) removing oxides and discolorations due to heat treating; 3) improving lubrication retention; 4) preparing surfaces for electroplating; and 5) easy, fast mold maintenance without the necessity for time-consuming disassembly.

The finish obtained by liquid blasting is a function of the finish before blasting. Liquid blasting will not make a rough ground piece smooth enough to do the work of a finished ground piece. A good die can be made better by proper blasting, but little can be done to improve a badly finished, malfunctioning die. Also, liquid blasting should not be thought of as a tool for producing a given dimension. All parts should be finished to dimension be-

fore blasting, then blasted with an abrasive fine enough to hold that dimension.

The maintenance of dies and molds after they are placed in service is every bit as important as new mold manufacture. Liquid blasting has been invaluable in this connection. Further, because such fine abrasives are used, repeated cleaning can be accomplished with a minimum of metal removal, and often without the disassembly of articulated or assembled molds.

The equipment most useful in plastics production is the cabinet type which can handle any die large enough to be held between two fingers and small enough to be swung into the cabinet by over-head hoist or rigged into position on rollers.

Perhaps few heat treaters supplying the plastics industry have had more experience with liquid impact blasting than Fred Heinzelman & Sons, New York, N.Y. One precise mold which Heinzelman produces (Martempered at 1475° F., quenched in hot salt at 325° F., and drawn to 55 Rc as 625° F.) carries extremely fine engraving, and is used to mold precision electronic components from the not-too-easily handled mineral-filled melamine. According to Heinzelman, the only way other than liquid impact blasting of cleaning this die after heat treating, without the expenditure of enormous amounts of hand labor, would be a very delicate acid etch. With liquid impact blasting, the part is made ready for use after heat treating by 3 min. of blasting.

In a good number of the dies for this use, nothing more need be done after liquid impact blasting, and all hand polishing is eliminated. In other cases, some hand polishing follows the liquid blasting in preparation for chromium plating—in the interest of superfinish work and long die life.

(MODERN PLASTICS, June 1951, p. 115)

SHORTCUTS IN PLASTICS CALCULATIONS

ESTIMATORS in plastic plants have frequent occasion to calculate the weight (W) of plastic required in a proposed product.

The accompanying table presents simplified formulas which should greatly reduce the time required for these calculations.

(MODERN PLASTICS, June 1951, p. 127)

NEW MACHINE WITH SCREW PRE-PLASTICIZER

NEWEST development of the Plastics Div., Jackson & Church Co., Saginaw, Mich., is a screw type 16-oz. horizontal injection machine featuring J-C's Hendry pre-plasticizing process.

Except for its pre-plasticizer assembly, which is mounted at right angles to the injection chamber, the machine is basically similar in appearance to standard horizontal types. However, it uses no torpedo in the injection chamber, depending upon the pre-plasticizer to plasticize the material and transfer it to the chamber, ready to be injected into the mold.

The variable pitch screw used in the pre-plasticizer extends from the hopper to the injection chamber of the press. The screw operates at pre-adjusted speeds to mull the plastic material prior to injection.

The extruder screw, designed for maximum mulling efficiency, is of the multi-stage type. The screw flights are so designed that the rate of feed is at maximum immediately

Simplified Formulas for Plastics Calculations

	TUBE	ROD	RECTANGULAR SECTION	RECT. SEC., ANY LENGTH	OTHER
Formula	W = f × (OD + ID) × (OD — ID)	W = f × (diameter)²	W = F × width × thickness	W = G × width × thickness × length	W = G × volume of one piece
W will give you	lb./M ft.	lb./M ft.	lb./M ft.	lb./M pcs.	lb./M pcs.
Specific gravity	Value of f	Value of f	Value of F	Value of G	Value of G
Acetate (1.33)	452.9	452.9	576.6	48.05	48.05
Butyrate (1.23)	418.8	418.8	533.2	44.44	44.44
Methyl meth. (1.19)	405.2	405.2	515.9	43.00	43.00
Ethyl cell. (1.11)	378.0	378.0	481.2	40.10	40.10
Nylon (1.14)	388.2	388.2	494.2	41.18	41.18
Styrene (1.05)	357.5	357.5	455.2	37.93	37.93
Polyethyl. (0.92)	313.3	313.3	398.8	33.24	33.24
Other materials or other specific gravities	340.5 × sp. gr.	340.5 × sp. gr.	433.52 × sp. gr.	36.127 × sp. gr.	36.127 × sp. gr.

below the material hopper; the flights are more closely spaced as the injection chamber is approached, thereby gradually reducing the volume of material handled per turn. The frictional heat produced by the action of the screw augments that from two individually controlled 4-kw heaters, insuring complete and uniform plasticization.

The injection chamber itself has one uniform heat zone, designed to maintain a holding heat for the preplasticized material. On the 16-oz. machine, this is obtained by means of strip heaters having a total capacity of 4 kw, with independent temperature control.

The 16-oz. machine has an injection cylinder 5 in. in diameter with an 8-in. stroke. Pressure exerted on the material in the injection chamber is 14,000 p.s.i., while the locking pressure on the clamp is 225 tons. The clamp cylinder is 17 in. in diameter and has a 14-in. stroke. Clamping of the mold is by straight hydraulic action, involving no toggle joints or levers.

Delivery of the plastic material from the pre-plasticizer worm to the injection chamber is regulated by two limit switches. After the die is closed, there is a delay for clamp pressure buildup, then the ram injects the material into the mold and retracts. However, it does not retract fully, but only far enough to uncover an opening in the injection chamber through which material from the screw is delivered, at which point the first limit switch is actuated. Pressure is automatically taken off the injection ram and it remains at rest. Simultaneously, the belt-driven pre-plasticizer screw, powered by a 15 hp motor, begins to operate. As the injection chamber fills with viscous material, the ram is pushed back until it energizes the second limit switch, stopping the screw. At this time, pressure is trapped in the cylinder by a gate block at the nozzle of the machine, thereby eliminating any possibility of spill-over at the nozzle and introduction of vacuum bubbles in the injection chamber.

The system is fully automatic and self-compensating. The screw can operate during the hold time of the press, the opening time, and the time required to remove the parts from the press, providing the fastest possible cycle time. The chamber fills automatically; no timers or hopper feed settings are required to handle this phase of the operation.

The extruder on the J-C machine is equipped with a variable speed drive to increase the adaptability of the machine to various molding materials.

The pre-plasticizer assembly is to be made available as a conversion unit for application to other types of molding machines.

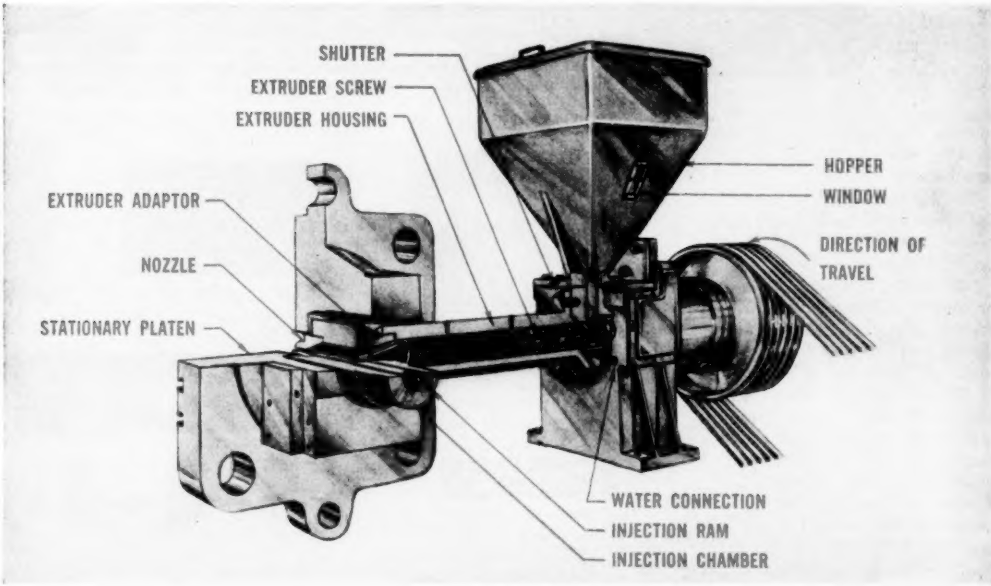
(Modern Plastics, December 1951, p. 115)

PRACTICAL EMBEDMENT OF FLOWERS

A PRACTICAL process for preparing flowers for embedment and for embedding them in clear plastic has been developed after more than five years of work by Prof. Randolph C. Specht of the University of Florida.

Experience shows that it is advisable to select flowers which have thick petals that do not detach easily from the calyx. Perfect specimens should be selected, as any blemish in the flower will be ex-

Screw of preplasticizing unit fills unobstructed injection chamber with completely plasticized material



aggerated during the preserving process. The University has had its best results when flowers were immersed in the preserving solution immediately after cutting.

As a result of experiments with more than 50 flowers, eight preserving solutions have been developed. Generally, colors ranging from red to pink are preserved in solutions having an acid reaction, while those ranging from green to blue require a solution having an alkaline reaction. The solutions that the Station has worked out are as follows:

No. 1) 1000 parts tertiary butyl alcohol, 10 parts thiourea, 20 parts citric acid.

No. 2) 1000 parts tertiary butyl alcohol, 10 parts thiourea, 20 parts sodium citrate.

No. 3) 1000 parts tertiary butyl alcohol, 10 parts thiourea, 20 parts sodium bicarbonate.

No. 4) 1000 parts tertiary butyl alcohol, 10 parts thiourea, 20 parts citric acid, 50 parts formaldehyde (40 percent).

No. 5) 1000 parts tertiary butyl alcohol, 10 parts thiourea.

No. 6) 1000 parts tertiary butyl alcohol, 100 parts peracetic acid (40 percent).

No. 7) 1000 parts tertiary butyl alcohol, 20 parts citric acid.

No. 8) 1000 parts tertiary butyl alcohol, 10 parts thiourea, 20 parts citric acid, 20 parts sodium sulfite.

While most flowers can be successfully preserved in either solution No. 1 or No. 2, some flowers require the use of the other solutions. If the color cannot be preserved in any one of the solutions, two or more of the solutions may be mixed in order to obtain the proper acidity or alkalinity.

The University offers the following suggestions, based on its experiments conducted in the field of flower preservation:

"Generally, specimens whose color ranges from pink to red are preserved in solution No. 1 and those whose color ranges from green to blue are preserved in solution No. 2. Some blues and greens may be treated in solution No. 3. Intermediate colors between red and blue may generally be preserved in either solution No. 1 or No. 2, or in a mixture of solution No. 2, in an amount so that the pH of the solution will be adjusted to the proper point at which the color is preserved. Certain reds may be preserved by treating the specimens in solution No. 2 followed by dipping in solution No. 1 until the desired color is obtained. Others may be treated in solution No. 7. Most orchids are best preserved in solution No. 5.

"Certain whites which have a tendency to turn to orange or brown may be treated in solution No. 4; however, best results may be obtained by dehydrating in solution No. 1 and then bleaching to white in solution No. 6. (When this solution is used, the specimens should be thoroughly dried over a desiccant,

(*Continued on p. 183*)

PRINTED CIRCUITS

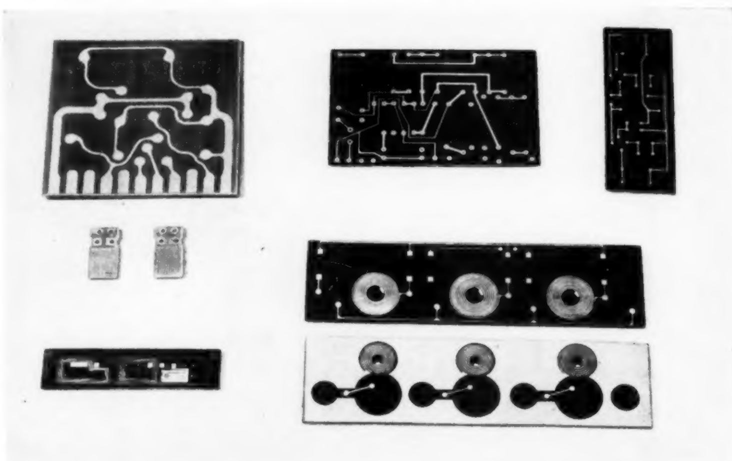
FIRST requirement for the production of a printed circuit of the foil-etched type is a sheet of dielectric, usually a plastic, with a metal foil firmly bonded to it. These foil-clad laminates are now manufactured by the leading producers of laminated plastics. Virtually all production to date has used a bonding film or tape manufactured either by Industrial Tape Corp., New Brunswick, N.J., or Minnesota Mining & Mfg. Corp., Minneapolis, Minn.

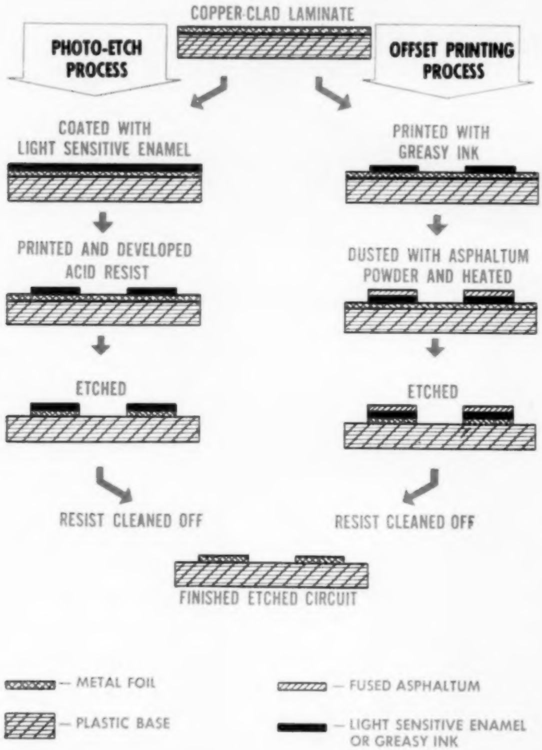
The first step in the production of the actual printed circuit piece is the preparation of a drawing for photographing. The circuit pattern is drawn in black ink on a white background, usually two to six times full size. From this drawing, using first a copying camera and then a step-and-repeat camera, a so-called step-and-repeat negative is made. This consists of the photographic negative of the original drawing, reduced to proper size, repeated on a photographic plate in a precisely regular manner. Just enough space is left between the rows of negatives on the plate to allow cutting and blanking out individual circuits.

Next step in the process depends on which one of several procedures is to be used for applying the acid resist pattern. The two principal methods are photoengraving and nameplate etching. In photoengraving, the acid resist is applied by a photographic method. In nameplate etching, an acid resist is formed by printing an ink on the metal surface and treating this ink in a special manner. Various printing systems have been tried, but the most common one is offset printing or metal lithographing.

Although the photoengraving or photo-etch method is somewhat more

Top: Examples of etched circuits. Middle, left: Two brass heaters on melamine-glass fiber laminate. Bottom: left—experimental T.V. tuner strip; right—T.V. circuit, I.F. strip





Successive steps in production of printed circuits by the photo-etching and photo-offset methods are shown schematically in related form

expensive than metal lithographing, its use is justified in many cases by the quality and precision obtainable.

The steps in production of printed circuits by photo-etching and by offset are shown schematically in related form in the sketch.

The etching chemicals vary with the foil. For copper and brass, 38 to 40° Baume ferric chloride solution; for aluminum, hydrochloric acid; for silver, 30% nitric acid. These solutions should be used at 85 to 95° F.

Etching time will depend on the etching machinery used. In paddle-type etchers, cup-shaped paddles on a rotating shaft pick up the etching solution and fling it against the surface to be etched in a fine spray. Etching is fairly rapid. Copper foil 0.00135-in. thick will be etched through in about 2 minutes. The number of plates which can be etched at one time in a paddle-type etcher is limited.

Tanks are more practical for mass production. The etching solution is placed in a suitable tank and agitation is provided, usually by compressed air jets. The sheets to be etched are either racked or hung in the tank or carried through the tank by a conveyor. Etching time for copper foil in this sort of equipment will vary from 10 to 20 minutes.

In general, foil-clad plastics may be fabricated with the same machinery and methods used for sheets without the foil. Shearing and sawing offer no complications. Special care should be taken in the design of progressive piercing and blanking dies so that the stripper plate will prevent any lifting of the foil when the punches are withdrawn from the piece. Drills should be sharpened with a negative rake similar to that used when drilling aluminum. When so ground, they will not catch the foil and lift it away from the plastic if holes are to be drilled through a narrow line of metal or at the termination of a line.

Fast punching in register with the etched pattern is really the only unusual and sometimes difficult production problem to be met. No general solution exists, however, since each printed circuit is of a different size and shape and the method of handling will depend on the type of tools required, the length of the strips, and the different other factors involved.

Methods of assembly of printed circuits into finished electronic or electrical devices are as varied as the applications. The most obvious is simply punching or drilling holes through the conductor and the plastic, inserting the leads of standard components into the holes, and hand soldering the leads to the conductors. Complicated circuitry is normally laid out on both sides of the piece to provide for crossovers. Connections between conductors on opposite sides may be made by component leads, tinned eyelets, rivets, pins, or simply short lengths of wire. Repairs can easily be made in the circuits. Com-

(*Continued on p.* 184)

LATEST ADVANCES IN DRY COLORING

USING a styrene colorant blend molding compound, it is now possible to successfully dry color the material for such industrial parts as wall tile, television masks, vacuum cleaner parts, utensil handles, thermometer housings, various containers, lamp globes, clock cases, and electrical cord plugs. More recently, refrigerator white parts and air conditioning louvres have also been produced on a commercial basis from dry colored molding material. Certainly, with the growing importance of the pre-plasticizing types of injection machines, the fields of application for dry coloring are fast becoming unlimited.

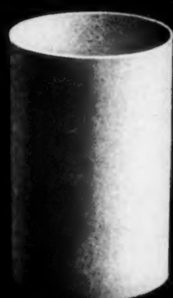
Dry coloring is a fairly simple method of producing colored molding powder from virgin crystal sty-

(*Continued on p.* 118)

tote box
tray
shipping container
trough
instrument case

tool chest
foot locker
refrigerator locker
laundry basket
machine housings
machine guards
truck body
trailer body

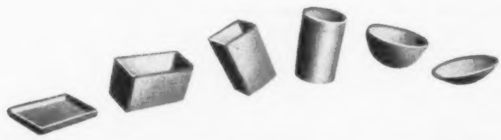
luggage
laundry hamper
medicine cabinet
file cabinet
telephone booth



waste basket
garbage pail
kitchen cannisters
ducts
rods

helmets
radomes
shelters
structural panels

boat hulls
sinks
baby carriages
light reflectors



rene plastic. Its chief advantages are simplicity, economy, and efficiency in operation. Inventory requirements are substantially reduced.

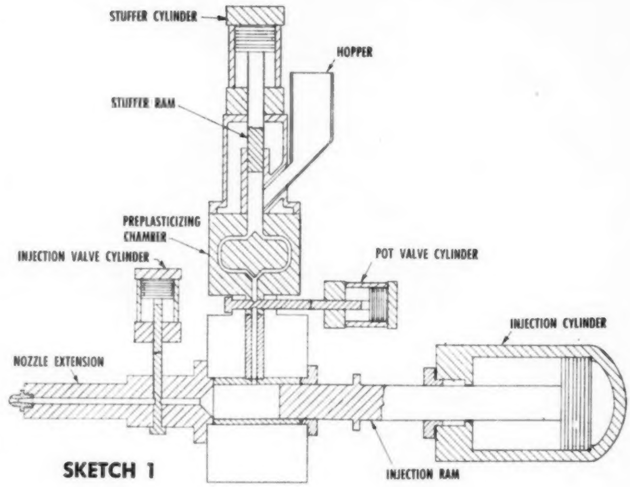
The method permits redyeing and reworking scrap, suggesting new fields for colored plastic applications in lower cost items.

With any of the end-over-end type blenders, the best results are obtained at 90% of the critical speed. (The critical speed is the speed at which centrifuging occurs.) Other types of blenders, such as drum rollers, concrete mixers, dough mixers, ribbon blenders, and other modifications can be used to good advantage.

Many different types of colorants are employed in the dry coloring operation.

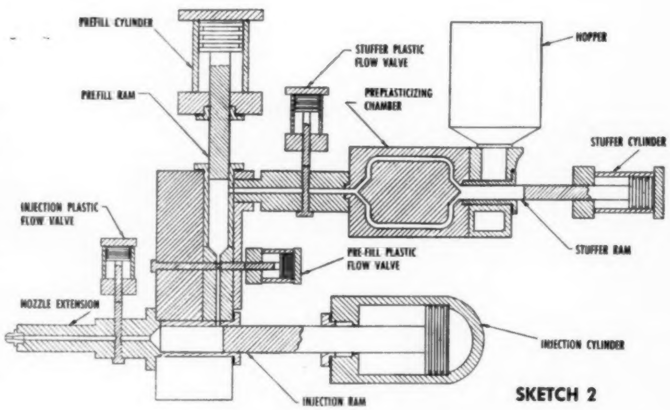
Oil-Soluble Dyes—As a class, oil soluble dyes are less stable to light and heat than inorganic pigments. Therefore, extreme care must be exercised in the selection of dyes to be certain that they have adequate stability.

Pigments—For the translucent and opaque formulations, a fairly wide range of colors in the spectrum (*Continued on p. 185*)



SKETCH 1

Schematic layouts of major component parts of two pre-plasticizers which increase capacities of injection machines. Above: Unit designed to increase the capacities of 9- and 16-oz. machines to 20 and 32 oz. respectively. Below: Large preplasticizer, which raises capacity of 60-oz. machine to a minimum of 200 oz., has prefill unit



SKETCH 2

PRE-PLASTICIZATION IN THE MACHINE

TWO types of fully proved preplasticizer-equipped units—a 32- and a 200-oz.—have been delivered by The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio. The pre-plasticizer or stuffer on the smaller machine, which can be added as a conversion unit to most 16-oz. H.P.M. machines now in operation, follows the general principle of certain others now on the market, in that the softened plastic material is forced directly from the pre-plasticizer into the injection cylinder. With this type, several strokes of the pre-plasticizer piston are required to fully charge the injection chamber, and charging can occur only when the injection ram is retracted.

On the other hand, the pre-plasticizer on the 200-oz. unit, which is assembled on a 60-oz. machine, goes one step further in efficiency. Here the design is such that the softened material is pumped into a holding or prefill cylinder chamber, which serves as an accumulator for the thoroughly pre-plasticized material.

Now under construction by H.P.M. are pre-plasticizers which can be installed on its 9-oz. machines and which will increase the capacity of these units from 9 oz. of styrene to a minimum of 20 oz. and in certain cases to as high as 34 oz. per shot. This conversion unit is similar to that used on the company's 32-oz. pre-plasticizer equipped machine, which itself is a converted 16 oz. and which will also, under certain circumstances, mold a heavier shot of styrene than the capacity at which it is presently rated.

The principle of operation of the simpler type of pre-plasticizer, which has been designed to increase the basic capacities of 9- and 16-oz. machines to 20 and 32 oz. respectively, is shown in Sketch 1.

Molders who are now operating 9- and 16-oz. H.P.M. machines may equip them with pre-plasticizers without any machining or major mechanical changes; the two pre-

plasticizer conversion units are designed for simple adaptation to their respective machines. The units are completely self-contained and mount on the injection cylinder strain rods.

The unit, which increases the capacity of a 60-oz. machine to a minimum of 200 oz., is shown in Sketch 2, which illustrates the principle of its operation. The major components consist of a preplasticizer or stuffer, a hydraulic prefill unit, and a hydraulic injection unit.

In operation, the stuffer unit fills the prefill unit with plasticized material. During this part of the cycle, the prefill plunger is in a raised or retracted position, the stuffer slide valve is open, and the same type of valve installed in the discharge end of the prefill unit is closed. When the prefill cylinder is completely filled and when the injection piston is retracted and the cycle controller calls for the injection chamber to be filled, the stuffer valve will close, the prefill valve will open, and a third valve on the injection nozzle extension will also close. With all three valves in their proper position, the prefill piston then forces a charge of softened material into the injection chamber. This operation, performed with one stroke of the prefill piston, takes only a few seconds. Only during these very few seconds of the machine cycle must the stuffer plunger remain inoperative.

Because the stuffer plunger of this unit can function at all other times, the plasticizing capacity of the stuffer is utilized practically to its fullest extent.

(MODERN PLASTICS, July 1951, p. 99)

CURING TELEVISION INTERFERENCE

RADIO frequency generators used for preheating plastics preforms and heat-sealing plastics film and sheet, can cause serious interference with T.V. and other commercial radio services, such as airport control, aircraft navigation, police, fire department, FM broadcasting, etc.

These oscillators generate a fundamental frequency plus a number of harmonics or multiples of the fundamental. These harmonics are the basic source of interference to television. Thus, for example, a preheating unit operating on a fundamental frequency of 26 mc. generates a third harmonic on 78 mc., a seventh harmonic on 182 mc., and an eighth harmonic on 208 mc. Such a unit could generate a signal capable of interfering with T.V. reception on Channel 5 with the 3rd harmonic, 78 mc., on Channel 8 with the 7th harmonic, 182 mc.; and on Channel 12 with the 8th harmonic, 208 mc.

If a radio frequency generating device is completely shielded, and if all wires leaving the shielded enclosure are effectively filtered, no appreciable power will be radiated to cause interference.

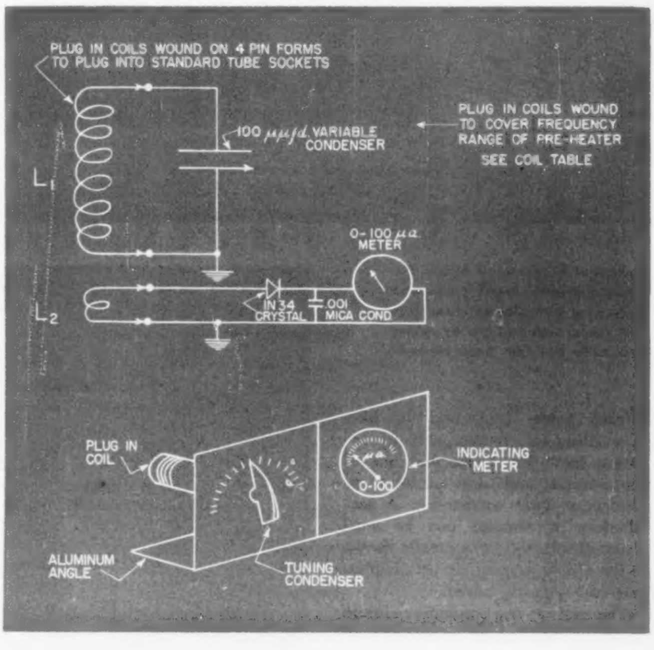
Some interference is caused by what is known as the "groundwave" signal, which usually is not bothersome beyond a few miles from the offending plant. An additional source of interference is caused by what is known as a "skywave" signal. This signal, inseparately associated with every groundwave signal, is capable of transmission for thousands of miles, depending on several variables.

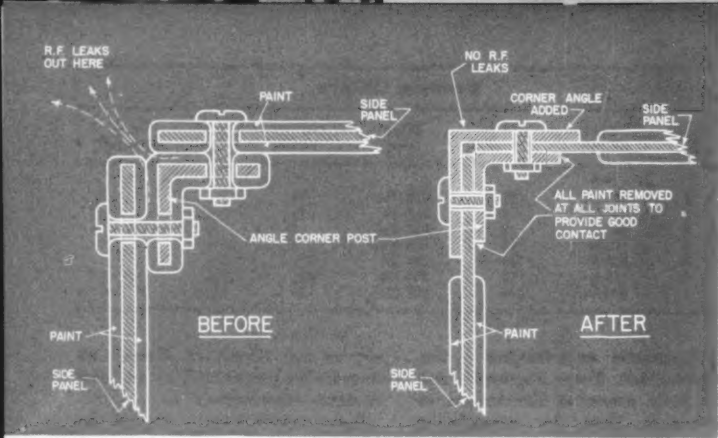
RF escapes through holes, cracks, joints, and vents in equipment containers and also radiates from un-

Wavemeter Coil Data

Coil No.	*Frequency range*	*No. of turns L 1*	*Wire size*	*Diameter of coil*	*Length of coil*	*No. of turns L 2*
	mc.			in.	in.	
1	60-170	3/4	#18 En.	1/2	—	1
2	40-110	2	#18 En.	1/2	1/16	2
3	19-55	4	#18 En.	1	1/4	2
4	7-19	15	#18 En.	1	5/8	3
5	3.5-8	30	#18 En.	1 3/8	1 1/4	4
6	1.7-4	75	#24 En.	1 3/8	1 5/8	6
7	0.650-1.7	170	#32 En.	1 3/8	1 1/2	10

Circuit diagram of crystal diode wavemeter for tracing RF leaks. Frequency range with seven plug-in coils (see Coil Data table at top of page) is from 0.650 to 170 mc.



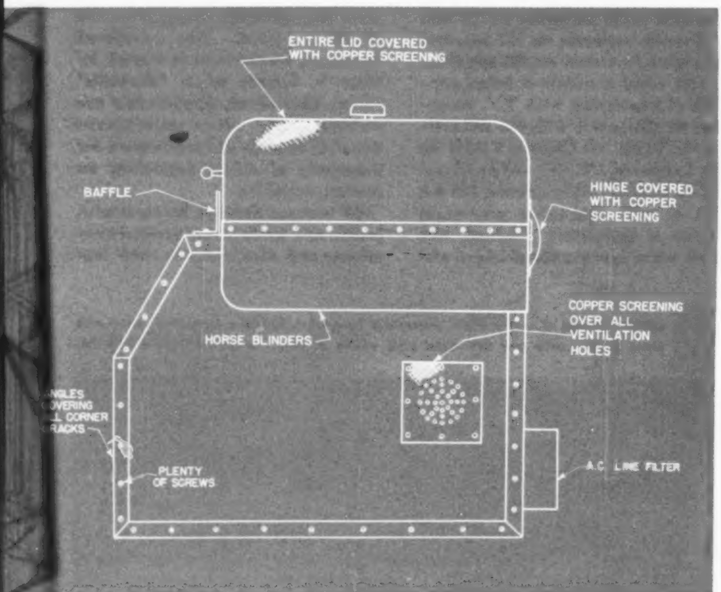


Escape path for RF from heater cabinet (left) is blocked (right) by adding outside corner to cover cracks between panels and corner posts, and by removing paint to insure electrical contact

coil by picking up known RF signals from a grid dip oscillator or a signal generator. (A neighborhood radio amateur or T.V. service man should be helpful on this.)

In using an instrument of this type, it is only necessary to put in the proper coil and, with the dial tuned to the approximate frequency of the machine, to explore the area around the oscillator for openings, cracks, or other points of possible leakage in the housing. Do not get too close to the machine or a point of heavy leakage is liable to burn out the mechanism of the meter. The higher the meter reading the more RF is leaking out.

If the pre-heater is satisfactorily shielded, no reading at all should show on the meter no matter how close it is held to the equipment. When exploring, it is advisable to shut down all other oscillators in the vicinity, because leaks from them might give false readings. The AC line leading to the oscillator, as well as the line feeding any external blowers, should also be explored for leaks. Leaks will usually be found at ventilating holes as well as at the various points where the sections of the housing are bolted to-

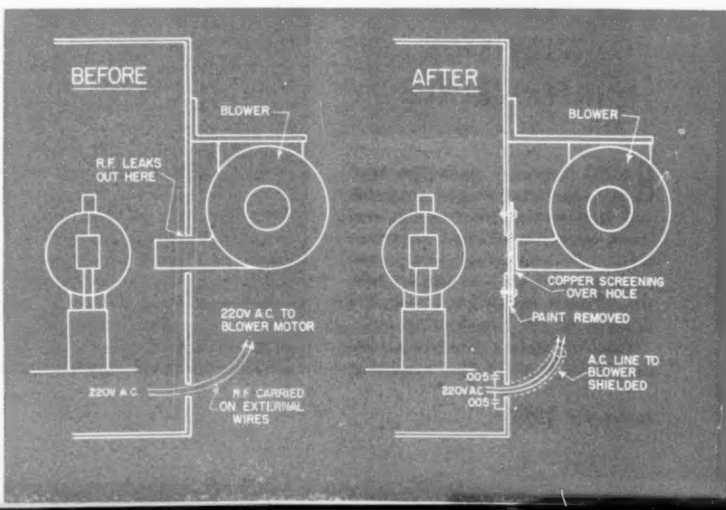


Leakage of RF from cover of high frequency preheater cabinet is prevented by covering ventilating holes and grills with copper screening and by adding front baffle and side "horse blinders"

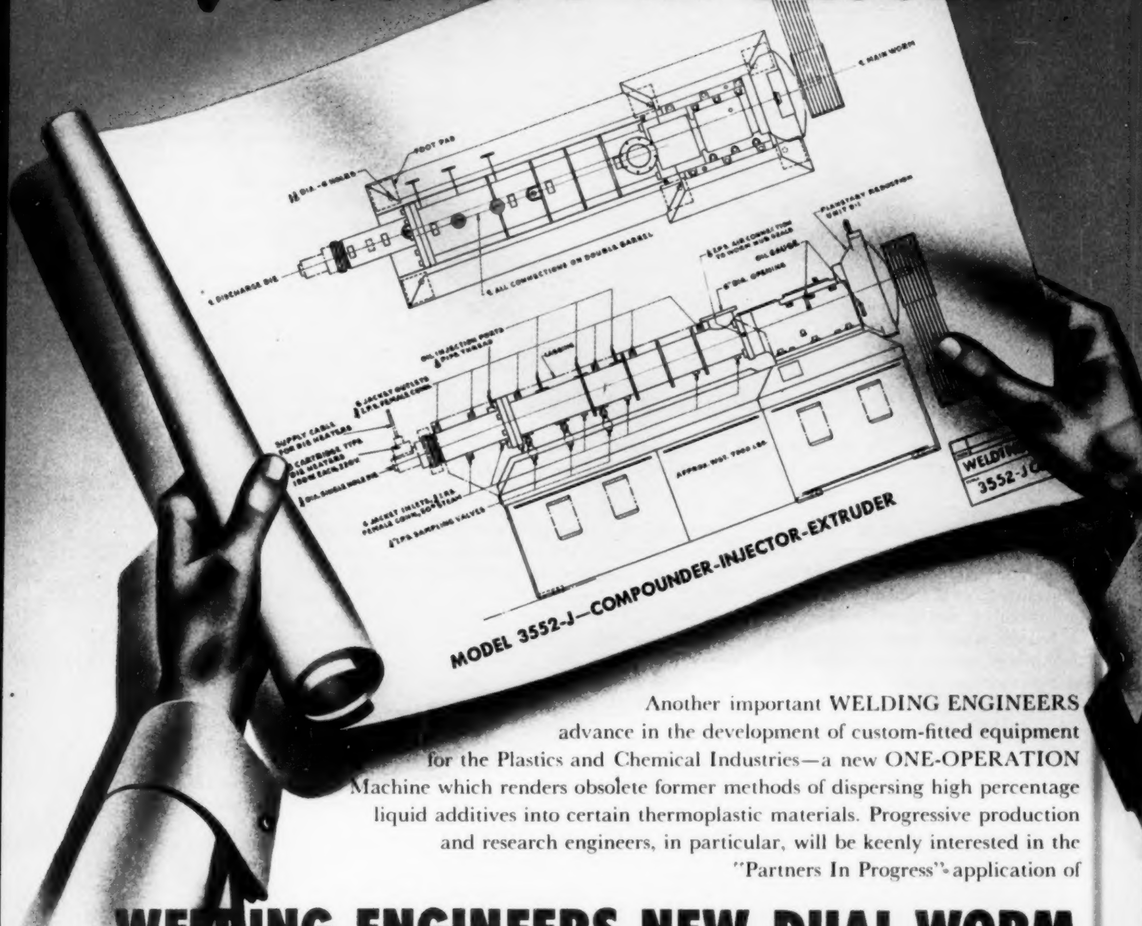
How RF radiation from blower hole and AC line was stopped. Blower was remounted so hole could be covered with screening in firm contact with cabinet; line was shielded and by-passed

filtered power leads and the like. A working tool is necessary for locating these RF leaks, and one of the simplest and most useful is an absorption-type wavemeter. A satisfactory wavemeter can be constructed following the details shown in the accompanying circuit diagram and coil winding table.

The dial on the condenser should be calibrated in frequency for each



Partners in PROGRESS



Another important WELDING ENGINEERS advance in the development of custom-fitted equipment for the Plastics and Chemical Industries—a new ONE-OPERATION Machine which renders obsolete former methods of dispersing high percentage liquid additives into certain thermoplastic materials. Progressive production and research engineers, in particular, will be keenly interested in the "Partners In Progress" application of

WELDING ENGINEERS NEW DUAL WORM COMPOUNDER-INJECTOR-EXTRUDER*

In contrast to the costly, time-consuming, difficult method of dispersing liquid additives of a high percentage into a wide variety of thermoplastic materials with expensive, bulky milling and batch mixing equipment, the new WELDING ENGINEERS Compounder-Injector-Extruder provides a continuous, simple, labor-saving method: The plastic material is fed to the hopper where it is readily accepted by the dual counter-rotating worms and *continuously* converted into a plasticized state. Further along the closed barrel, liquid additives are pumped in through a series of INJECTION PORTS by adjustable metering pumps. Under high pressures in the barrel, the long dual worms intensively mix the ingredients and *continuously* deliver the compounded material to your next production step.

The WELDING ENGINEERS compounder-injector-extruder is constructed of materials as required by your process. It includes all advantages of WELDING ENGINEERS advanced equipment. Write us on *your* applications of the versatile compounder-injector-extruder method in your new equipment planning. We would like to become "Partners in Progress" with you.

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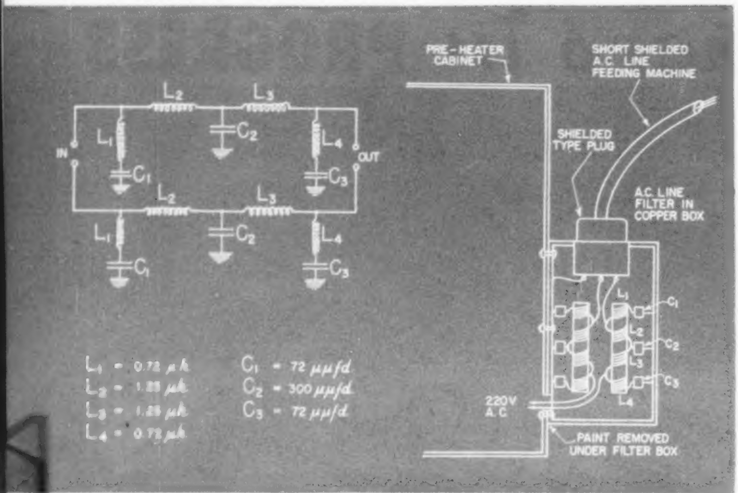


Circuit of AC line filter, coil and condenser data, and method of installation. All paint was removed at points of contact and a short shielded AC feed line was used

gether. This latter source of trouble may be caused either by actual cracks or openings or by the fact that the parts have been painted previous to assembly, and therefore have no electrical contact between them.

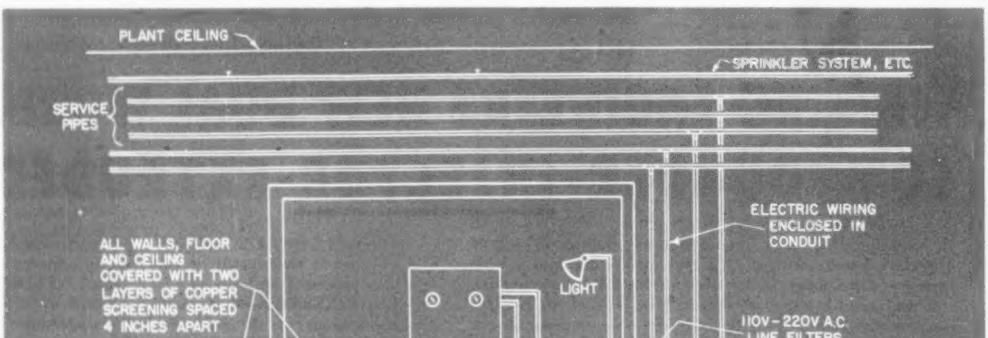
Another source of trouble comes from the cover of the machine. This is generally hinged so that it can be conveniently opened to load and unload preforms. Accompanying illustrations show the procedures which should be followed to completely shield a high-frequency oscillator.

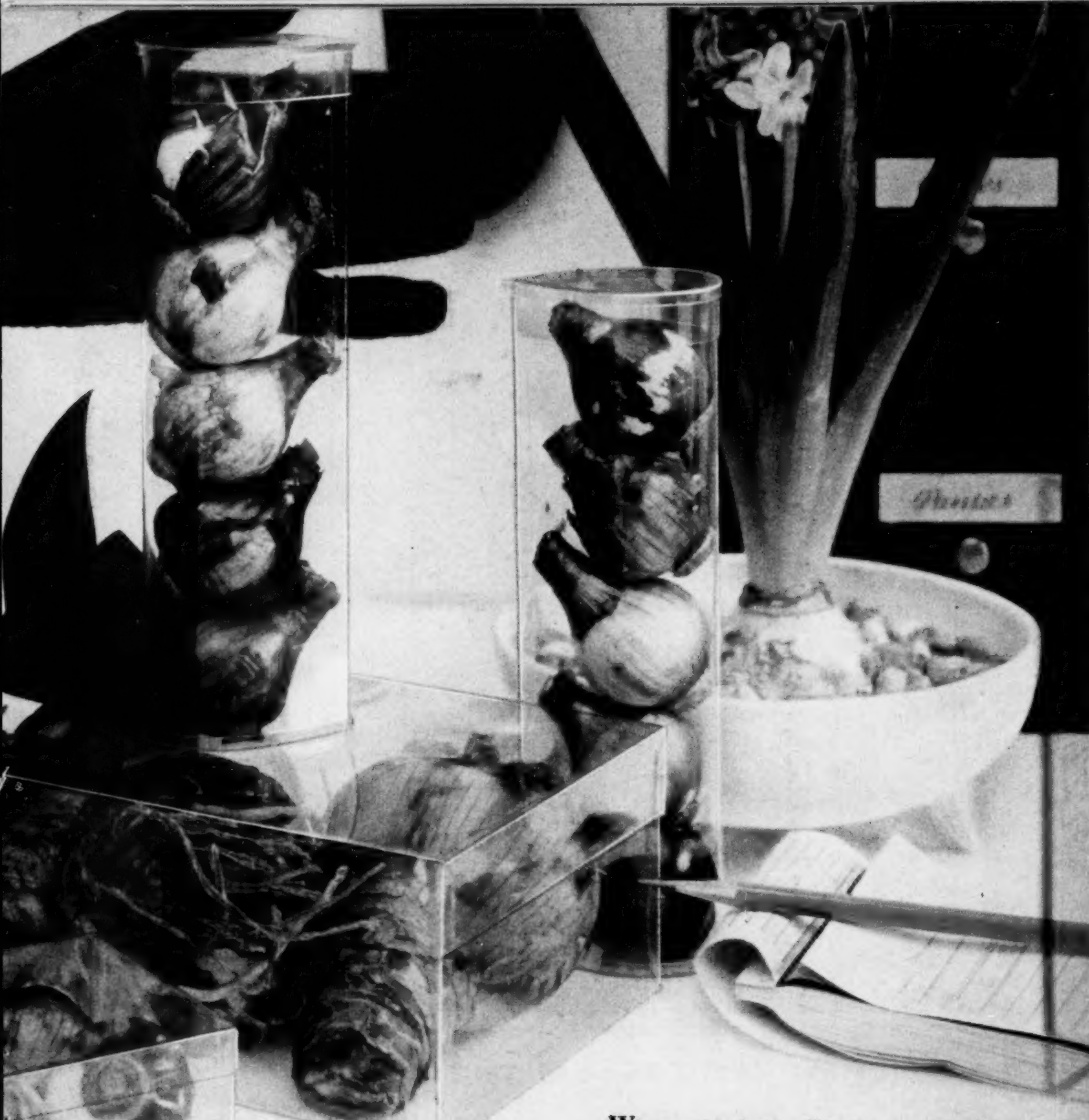
It will also be necessary to install an AC line filter to block the RF leakage through the power leads back to the power lines. The makeup of such a filter is illustrated. Having completed the shielding and filtering job, a second check should be made on the oscillator with the wavemeter. If no reading is obtained, the job has been satisfactorily completed.

The shielding of high-frequency equipment used for heat-sealing must be approached from a different angle. It is usually not practical to completely shield these units and at the same time have them open enough for operation. It is therefore necessary to completely shield the working area. One of the drawings illustrates the correct mechanical approach to this problem. Note that two layers of copper screening are used, one on the inside of the wood framework and one on the outside. Top, sides, and floor are covered in this fashion. All metal objects, such as pipes, enter at one point only, and each is bonded thoroughly to the screening both inside and out. All electrical wiring is fed via conduit to a shielded line filter at this same point. All joints in the copper screening are overlapped at least 4 in., and even the screen door is bonded. In this work it must always be remembered that pipes, conduits, or other metal parts to be grounded must be cleaned of paint, rust, or any other non-conductor which may be present before the final electrical connections are made.

(Modern Plastics, September 1951, p. 101)

Adequate shielding of room in which preheaters are located demands two layers of copper screening all around, use of AC line filters, and bonding of all pipes, conduits, etc., to the shield screens at point of entry into the room





The Year 1951 in Review

KEYNOTE of the year in the plastics industry was, of course, the defense program with its attendant opportunities for expansion into new industrial applications and its disruption of many normal markets for plastics. A record-breaking production effort was not sufficient to permit realization of a goal set early in the year to relieve shortages in metals needed for defense by replacements with plastics, and the rapid development of demands quickly led to the establishment of preference ratings for deliveries of certain types of synthetic resins. Successful applications of plastics to important items connected with defense are progressing satisfactorily through the experimental stages. Continuous extrusion is providing plastics in many decorative and structural shapes to replace aluminum, stainless steel, and those other metals which are reserved strictly for defense purposes.

The above survey of the current situation in the plastics industry is actually lifted verbatim from the review of the year 1941 published in the January 1942 issue of this magazine. A significant difference in the 1951 picture is the five-fold larger volume of production of plastics now and the greater variety and versatility of present-day products. Hence, there should be no hesitation or difficulty in meeting the challenge presented by the recent announcement that the National Production Authority has ordered that beginning January 1, 1952, manufacturers of non-defense products shall limit their consumption of copper to 10 to 35%, aluminum to 20 to 35%, and steel to 50% of their pre-Korean levels.

The status of the utilization of plastics in military items has been brought up to date in several surveys covering molded products (1)[1], reinforced plastics (2), dielectrics (3), Quartermaster Corps items (4), and flexible packaging (5). Military aircraft is using plastics in transparent enclosures, radomes, ducting, electrical systems, wing and rudder parts, bulkheads, flooring, and the like (6-11). A vinyl-coated fabric shelter designed for maintenance and repair work on fighter planes in the Arctic provides a 45-ft.-square working area with no internal obstructions (12). The Navy is producing 12-ft. wherries from glass mat and polyester resin at the rate of one per day; polystyrene foam is employed as the flotation material (13). Army Ordnance is using large envelope type vinyl shrouds to protect heavy production machine tools during shipment and storage (14). The Signal Corps is utilizing assault wire for battlefield communications, which requires 14 lb. of polyethylene and 8 lb. of nylon insulation per mile (15). Other special developments in military equipment include a molded nylon telephone handset for use on amphibious vehicles (16), a vinyl seawater desalting unit for use on life rafts (17), and an expanded-plastic watertight life preserver suit (18).

Materials

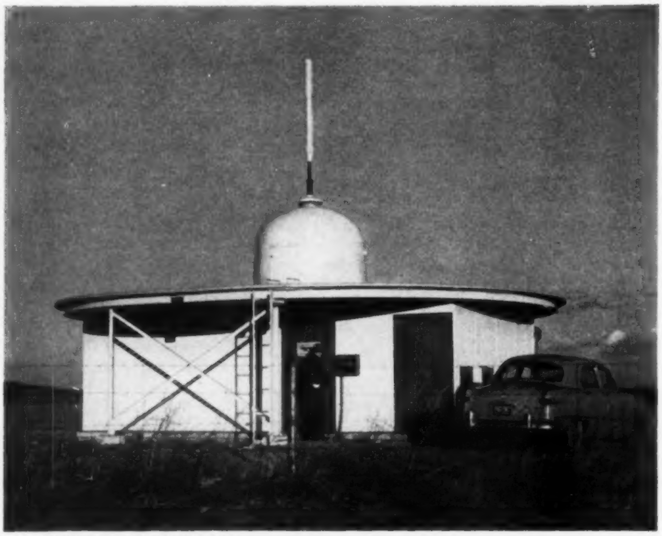
Acrylic Polymers—Another transparent plastic came closer to commercial availability as two companies, Arnold, Hoffman & Co., Inc. and General Aniline and Film Corp., undertook the production on an experimental scale of polymethyl alpha-chloroacrylate (called Gafite by the latter firm). The softening point, heat distortion temperature, tensile strength, and hardness are higher than those of polymethyl methacrylate. Its greater flame and crazing resistance are advantageous in glazing applications (19). Creep properties in tension, compression, flexure, and torsion (20, 21), and molecular weight distribution (22) in polymethyl methacrylate were investigated. The gelation of polyacrylic acid was studied (23).

Cellulose Plastics—The availability of a hot- and cold-water-soluble derivative of cellulose—sodium cellulose sulfate—in experimental quantities was announced by the Tennessee Eastman Co. Films prepared from this compound are colorless, transparent, strong, flexible, and oil-resistant. Other potential applications are based on its suspending, thickening, and stabilizing properties (24).

The properties of a series of fully esterified cellulose esters from acetate through palmitate were described. As the number of carbon

* Reg. U. S. Pat. Office.

[1] Numbers in parentheses link to references starting on page 138.



Courtesy Civil Aeronautics Administration

Reinforced plastic radomes for sheltering precision equipment in air navigation system are 8 ft. in diameter by 7 ft. high. Installation of 400 such domes is planned

atoms in the acid increases, density, tensile strength, specific rotation, and moisture sorption decreases. The melting points pass through a minimum at the C_8 ester, while maximum solubility is reached with C_5 or C_6 esters (25, 26).

Heat-stable compositions containing high-butyryl cellulose acetate butyrate, plasticizer, resin, and wax can be melt cast at about 300° F. without the use of pressure or volatile solvents; these casting compositions should be useful for short production runs in metallic or nonmetallic molds and in limited reproduction of patterns in foundries (27). Cellulose acetate butyrate plastics can be improved in weathering resistance by incorporating ultra-violet inhibitors, such as *m*-hydroxybenzoate (Salol); this is especially significant for irrigation, oil field, and automotive applications (28).

The effects of solvents, diluents, and plasticizers on the film-forming properties of cellulose acetate propionates were determined (29). Other reports dealt with the properties of ethyl cellulose molding materials (30, 31), and with cellulose nitrate (32), cellulose acetate (33), and cellulose acetates and butyrates (34).

Ethylene Polymers—The continued growth of the market for polyethylene in the packaging industry was amply evident in enthusiastic reports concerning its use in film and bottle forms as containers for foods (35), drugs (36), cosmetics (37), perfumes (38), inks (39), and chemicals (40-42). Other significant applications included adhesive-backed, pressure-sensitive, oriented tapes for protective wrapping on pipes and electrical equipment (43), cable insulation (44), and balloons for high-altitude weather research (45). Properties and uses (46) and fabrication techniques (47) for polyethylene were reviewed. The effects of light (48), heat (49), and polyaxial stress (50) on the polymer were described; in the latter investigation it was shown that the addition of polyisobutylene or butyl rubber improves crack resistance.

Fluoroethylene polymers further demonstrated their utility in specialty applications requiring superior thermal, electrical, mechanical, and chemical properties, such as in packings and gaskets (51), electronic tubes (52), and filters (53). The unusual techniques required for compression molding and extrusion of polytetrafluoroethylene were reviewed (54).

Phenolic Plastics—Improvements in phenolic materials, molding techniques, mold design, piece design, and high frequency pre-heating have made possible much larger moldings and a greater diversity of special purpose applications (55). These improved phenolics include admixtures with rubber (56, 57), graphite (58, 59), and mineral filler (60). The large market for phenolic resins in combination with sawdust and other fibrous wastes to produce structural boards was further explored (61-63). Production records show that phenolic bonding resins in foundry casting are conserving metal and reducing machining time and costs (64). Resin-impregnated densified wood (compreg) is growing steadily in importance as a tool and die material and for a number of other industrial and decorative applications (65).

Several noteworthy contributions were made to the synthesis and determination of the chemical structure of phenol and resorcinol resins (66-72), and to their reaction with rosin to form coating resins (73). On the physical side, one author published formulas for the calculation of stresses set up in phenolic moldings by absorption of water under various conditions (74), and another investigated an indentation hardness method for evaluating degree of cure (75).

Polyamides—In the nylon resin field, emphasis in the 1951 literature was on the preparation and properties of new compounds (76-79). A study of the mechanism of degradation of polyamides pointed the way to structural and compounding changes to improve the durability of these materials (80, 81). A group of polyamide resins of particular value in adhesives and coatings was described (82).

Polyesters—The unsaturated polyester resins, which cure by polymerization due to the carbon double bonds present, have made further advances in the molding and laminating fields. The molding compound owes most of its increasing acceptance to such of its properties as: high-speed cure, low-cost molding requirements, excellent electrical properties, high heat resistance, dimensional stability, and low water absorption (83). The properties and applications of polyesters in casting and laminating were reviewed (84, 85). New compounds investigated included allyl esters of fatty acids (86), polyesters with olefinic substit-

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Courtesy Monsanto Chemical Co.

Large envelope type vinyl shrouds are made in 50 sizes to protect widely varied sizes and shapes of heavy production equipment during shipment and while stored out-of-doors

uents (87), and polymers of maleic anhydride with aldehydes and ketones (88).

Styrene Polymers and Copolymers—Commercial production of polystyrene by mass, suspension, and emulsion processes is limited by engineering considerations of heat transfer rather than by rate of reaction; future developments will be directed toward reducing capital costs (89). A novel use of styrene resin is its combination with ground marble to be laid into grooves in asphalt, concrete, or other road surfaces to provide permanent traffic lines (90). Properties and applications of polystyrene in large moldings were reviewed (91).

There were numerous reports of physical and chemical investigations of polystyrene, indicative of its approaching dominant position among thermoplastics. These related to the effect of orientation (92), strain rate (93), and temperature (94) on mechanical properties, electrical storage charge in polystyrene film (95), crazing (96, 97), solution characteristics (98-102), and the degradation of polystyrene (103). It was demonstrated that the physical properties of commercial polystyrenes are mainly controlled by the content of very low molecular weight species (104). The effects of various chemical catalysts (105-110), agitation (111), and light (112) on the polymerization of styrene were reported.

A series of butadiene-styrene copolymers with charging ratios of 50/50 to 10/90 was prepared and evaluated; these materials are used for rubber reinforcement, high-impact plastics, and protective coatings (113-115). Copolymerization of styrene with 2-chloroallyl linoleate (116), butadiene (117), and p-methoxystyrene (118) was studied.

Vinyl Polymers and Copolymers—The league-leading vinyl resins continued to expand into new fields. Unplasticized polyvinyl chloride is superior in heat and chemical resistance, electrical properties, and mechanical strength to the plasticized product. It is well suited for the manufacture of chemical plant equipment, pipes, sheeting, films, bristles, and fibers (119-122). Important contributions were made to our knowledge of the plasticization (123-128) and stabilization (129, 130) of polyvinyl chloride. Products made from vinyl plastisols, organosols, and solutions by methods ranging from slush molding and injection molding to casting, dipping, and spreading include inflatable toys, fish lures, plating racks, tool handles, safety clothing, raincoats, upholstery, and floor coverings (131-133). The properties of saran (polyvinylidene chloride) films (134) and of saran-coated paper (135) were investigated.

Polyvinyl alcohol has outstanding solvent resistance, gas impermeability, flexibility, and toughness, and is useful for textile sizing and finishing and paper coating (136, 137). Polyvinyl acetals are employed in safety glass interlayer, primers for metals, coatings for textiles and paper, and wire insulation (138, 139). The vinyl esters of caprylic, capric, lauric, myristic, palmitic, and stearic acids were prepared (140); polyvinyl palmitate, caprylate, and palmitate-acetate are effective viscosity index improvers for lubricating oils (141). Electrolytic properties of aqueous solutions of polyvinylpyridine (142) and the polymerization of vinyl (143, 144) and vinylidene (145) compounds were studied.

Other Polymers—The new epoxy resins found unexpected uses as stabilizers in chlorine-containing plastics and in the manufacture of shock resistant phenolic molding compounds as well as in coatings, adhesives, laminates, and potting compounds (146). Silicone resins and rubbers are extremely useful for engineering applications involving abnormally high or low operating temperatures, such as in automotive and aircraft engines and structures (147, 148). Polyalkylene and arylene-alkylene sulfides and polythiolesters were prepared and evaluated; some of these polymers give orientable fibers on cold drawing (149-153). The hardness of modified alkyd resins was shown to correlate with the unsaturation of the modifying fatty acids (154). The synthesis and properties of urea-formaldehyde (155, 156) and aniline-formaldehyde resins (157), polyallyl phenyl ethers (158), and polyisobutylene (159, 160) were investigated.

Plastics are made from natural rubber latex by reaction with chlorine and hydrogen chloride and by cyclizing; new applications for these compounds were reported (161). Recent developments in hard rubber were reviewed (162). New elastomeric and thermoplastic derivatives of butadiene were described (163-167). The photodegradation of GR-S (butadiene-styrene copolymer) in solution occurs only if oxygen is present (168).

The cross-linking reactions (169)

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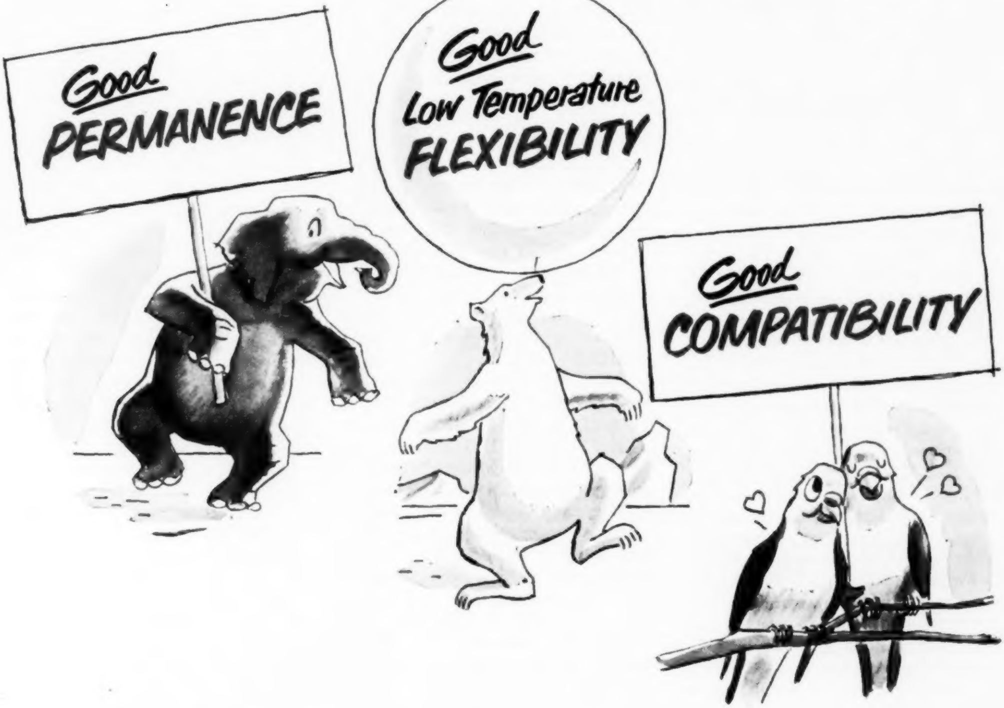

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and plastic flow properties (170) of casein were investigated. Thermoplastic resins with good film properties and good water and acid resistance were made from lignin (171-173). Industrial applications of starch plastics can be expected if economical means are found for obtaining amylose either by starch fractionation or from starches of high amylose content; amylose film should find unique uses in the food and pharmaceutical fields, based on its digestibility and breakdown to absorbable sugars (174, 175).

The concentrated interest and diverse attack of numerous investigators on polymerization and polycondensation problems is leading to a better understanding of the reaction mechanisms and hence to improved polymers (176-189). Likewise, studies were conducted on the absorbing capacities of ion exchange resins based on halogenated allyl derivatives (190), sulfonated styrene-divinylbenzene copolymers (191-194), phenolic and amino-aldehyde condensates (195, 196).

Laminates and Sandwich Materials—It is significant that the percentage of industrial laminate output going into military products is higher than that of any other category of plastics except extruded wire insulation. This is attributable to improvements in materials and techniques, which are opening up new applications in both military and civilian markets (197-200). The successful bonding of metal foils to many grades of laminates has resulted in ever-widening use of printed circuits, which replace conventional wiring, resistors, capacitors, and inductances in electronic equipment (201). Laminated cylinders up to 90 in. in diameter, 4 in. in wall thickness, and 150 in. in length are now being made for use in power transformers (202). The low-pressure laminating resins in combination with glass fiber, mat, and fabric have been fabricated into tote boxes, trays, portable lockers, and military luggage (203), railroad tie plates (204), vacuum cleaner dust bowls (205), and a flexible decorative covering for kitchen counters and furniture (206).

Many significant contributions were made to our knowledge of the properties of laminates. These included data on the effects of high and low temperatures on mechanical strength (207-209), creep and fatigue characteristics (210-211), bearing strength (212), interlaminar strength (213), thermal diffusivity, conductivity, and heat capacity (214), and electrical insulating properties (215-216). A finish for glass fiber that reduces loss in mechanical strength under wet conditions to less than 10% was described (217).

Honeycomb cores for sandwich structural materials are now being made with reinforcements of paper, cotton fabric, glass cloth, and aluminum foil by seven manufacturers. The principal uses for the honeycomb sandwiches are aircraft parts, walls and doors for houses and factories, and shipping containers. One manufacturer predicts their use for at least 40% of new aircraft frame weight by 1956 (218). New developments in expanded plastics made of styrene, urea, and phenolic resins, cellulose acetate, and rubber were described (219-221).

Plasticizers, Other Additives—Production of plasticizers reached 242 million pounds in 1950 and may be 20% higher for 1951. These figures do not include polyester plasticizers, which are particularly useful in upholstery and wire coating because of their non-migratory characteristics, and petroleum-derived materials which are used in compositions of high filler content, such as flooring, because of low cost (222, 223). Dry coloring by blending the plastic powder and colorants in the molding shop has been perfected to such an extent that it is estimated that more than 60% of all polystyrene molded is now dry colored. The process has also been adopted for practically all thermoplastics and some thermosetting materials (224, 225). The effectiveness of commercial destaticizers in minimizing dust collection on plastics was discussed in an outstanding report of a comprehensive investigation of this problem (226). An alpha ray static neutralizer for stopping dust collection while printing vinyl film or spraying polystyrene moldings was described (227).

Processing

Injection Molding—Improvements in injection molding and extrusion techniques and equipment kept pace with the growth of the thermoplastics branch of the industry. Our review of 1941 developments contained the following statement: "Whereas a 6-oz. machine was considered large a year or so ago, standard single-nozzle machines are now being offered in 12-, 16-, and even 22-oz. capacities." Compare these capacities with those listed in the following report in July 1951: "Today there are 54 injection molding machines rated at 60-oz. or more in operation in 31 different plastic molding plants; and 9 of those 54 machines are capable of injecting 200 oz. or more!" (228). The world's largest injection molding machine is the 300-oz. Watson-Stillman model, of which two are now in operation (229). These high-capacity machines have been achieved without resort to machinery of monstrous size

Honeycomb sandwiches are being used as structural materials in many knockdown military buildings. Shelter below is for the Corps of Engineers

Courtesy United States Plywood Corp.

seamless drinking straws

THAT elusive last drop flows as freely as the first through Sweetheart drinking straws, now continuously extruded of resilient Tenite. These disposable, lightweight sippers spring back into shape when mashed, never tear or become soggy in usage. Transparent Tenite colors give them a festive appearance.

The toughness and flexibility of extruded Tenite are further demonstrated in such varied products as tooth brush containers, irrigation tubes, and large pipe for the oil fields. The durable plastic can be readily molded, too, in exact dimensions and a limitless number of chipproof colors.

For additional information about the properties and many uses of Tenite, write Tennessee Eastman Company, Division of Eastman Kodak Company, Kingsport, Tennessee.

Sweetheart drinking straws manufactured by Maryland Paper Products Co., Baltimore, Md.

TENITE

an Eastman plastic

Information regarding Tenite is also obtainable through representatives located in Chicago, Cleveland, Dayton, Detroit, Leominster (Mass.), Los Angeles, New York, Portland (Ore.), Rochester (N. Y.), St. Louis, San Francisco, and Seattle; and elsewhere throughout the world from Eastman Kodak Company affiliates and distributors.

by incorporation of preplasticizing units, which not only increase shot capacity but also reduce discoloration and degradation of the material by operating at lower temperatures (230, 231). Multi-cavity operation of these high-capacity machines also offers interesting possibilities in decreased labor and capital costs and fewer rejects (232).

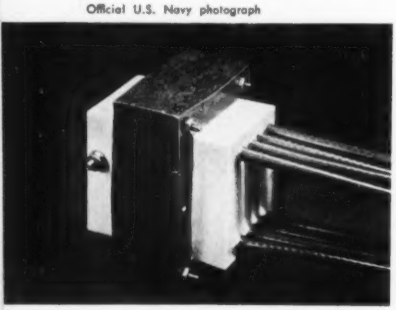
A better understanding of the injection molding process was obtained by a photographic study of the polymer cycle which revealed phenomena occurring during filling, packing, discharge, sealing, and sealed cooling (233, 234). Variables which affect mold shrinkage of thermoplastic molded parts were discussed (235). An automatic gate breaker operates while the material is still warm in the closed mold and thus reduces fracturing into the molded part (236). Other developments in injection molding equipment were described (237).

Extrusion Molding—The importance of this process to the plastics industry was recognized by the Hyatt Award to James Bailey for his pioneering work on the development of equipment and techniques for the continuous dry extrusion of thermoplastic sheets, rods, tubes, and shapes (238). The effects of temperature (239), pressure (240), and other variables (241, 242) on the operation of extrusion machines and the properties of extruded plastics were discussed. Extrusion compounding of thermoplastics is increasingly employed by molders and materials manufacturers to obtain material of uniform color and working properties (243-245).

Compression Molding—Problems concerned in compression molding large parts such as radio and television cabinets continued to receive attention (246-247). Special techniques in conditioning phenolics (248), maintaining close hole tolerances (249), eliminating television interference in radio frequency preheating equipment (250), and obtaining three-dimensional effects (251) were described. Contributions to the art of mold construction included the design of a threaded cup mold to eliminate hand unscrewing (252), mold finishing with aqueous abrasive suspensions (253) and diamond paste (254), and hobbing (255).

Coils of small transformer are potted with epoxy resin cast in acrylic mold

Official U.S. Navy photograph



Laminating and Calendering—The design and construction of matched metal molds for the molding of reinforced plastics and detailed procedures for the ejection of such parts were described (256). Polyester glass-fiber laminates can be fabricated with conventional techniques and standard equipment for blanking, shearing, drilling, tapping, rotary and band saw cutting, milling, routing, and cementing (257-259). Large parts, such as aircraft wings, car doors, radio cabinets, and orthopedic jackets have been molded without pressure from asbestos felt and phenolic resin (11, 260). Lamination of decorative material, business cards, maps, and the like between flexible vinyl films is accomplished by heat and pressure (261). Mechanical problems encountered in calendering operations were discussed (262-264).

Casting—Potting of electrical circuits and compounds with plastics of the phenolic, furan, polyester, styrene, and epoxy types has become an important factor in the shockproofing and miniaturization of military equipment (265-268). A research project at the University of Florida has culminated in a process utilizing polyester casting resin for the preservation of the color and shape of flowers (269, 270). Techniques were described for molding articles from plastisols (271), and carving (272) and embossing (273) on cast acrylic sheet.

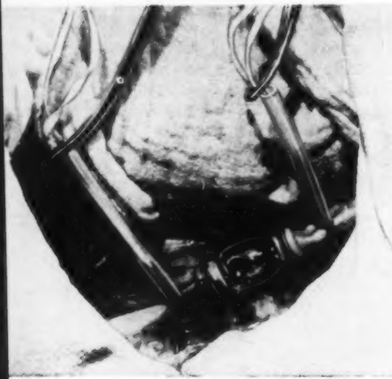
Fabricating and Finishing—More than 200 million yards of vinyl film are printed annually by six different methods—rotogravure, drum-type gravure, surface, transfer, aniline, and silk screen printing (274). Equipment is now available for the fabrication of completely heat-sealed raincoats (275), for the production of controlled porosity in sheet materials by electroventing (276), and for the reproduction of small objects from vinyl rigid sheet by swedging (277). Methods of welding thermoplastics include hot gas, heated tool, high frequency, friction, flame, and radiant heat (278-280). Equipment was described to shape sheet thermoplastics by vacuum molding (281) and centrifugal forming (282).

Devices and techniques were developed for machining melamine moldings (283), removal of flash (284), vacuum deposition of metallic coatings (285), and flame polishing (286). Types of blades and saw velocities were recommended for bandsawing of plastics (287). The effects of molding cycles and annealing on crazing of polystyrene moldings were investigated (288). Stencils for protection of plastic parts to be decorated with lacquers by spraying are accurately produced by electroplating a copper shell over a prepared matrix; the electroforming process is also useful for the preparation of molds for injection, low pressure, and slush molding (289, 290). Safety precautions in the manufacture of resins, the fabrication of plastic products, and the grinding of scrap plastic were set forth (291).

Design—Principles involved in the combined use of metals and plastics in molded products were reviewed (292). Plastics can also assist in the design of all-metal parts by serving as patterns (293) or as models for photoelastic stress analysis (294). Shortcuts useful in the calculating of the weight of material required for proposed plastic parts were published (295).

Applications

Adhesives—This highly diversified market for resins, which passed the 100 million lb. mark in 1950, is now taking close to 150 million lb. annually. The fundamental factors in adhesion, the classification of adhesives, the design of adhesive joints, and the principles involved in the selection of adhesives for specific applications were reviewed by several authors (296-299). The strengths of bonds obtained between metals and rubber, polyethylene, polystyrene and phenolic and epoxy resins (300-304), and adhesion problems with textiles (305), cellulose,



Acrylic aortic valve is held firmly in place by two ligatured nylon rings

(306-307), plastics (308-309), and wood (310-313) were investigated. The use of ultrasonic waves to determine the dynamic moduli of resinous joints (314) highlighted studies of adhesive-adherend systems (315-317). A non-crazing urea-formaldehyde resin adhesive was formulated with the resin, woodflour, furfural, and ammonium chloride (318). Seven rat-repellent compounds were tested in adhesive compounds (319).

Building—A comprehensive review of the use of plastics in the building industry covered structural members, wall surfacing materials, translucent walls and partitions, roofing materials, piping, trim, plumbing, flooring, sound and thermal insulation, lighting fixtures, adhesives for wood, and glass-fiber reinforced products (320, 321).

Translucent corrugated sheet material made of glass fiber and polyester resin (Corrulux) is being used as a glazing and roofing material (322); at the year's end a fibrous glass-resin transparent sheet (Duralux) with the strength of reinforced plastics and a light transmission of 75 to 90% became available for use as shatter-resistant window panes and instrument panels (323). Other developments in transparent and translucent plastics included Flexseal bomb glass made with a polyvinyl butyral interlayer (324), corrugated rigid vinyl sheeting as a light diffuser for concealed lighting (325), corrugated acrylic panels for shower doors (326), and acrylic lighting fixtures in the new House of Commons (327). Tightening restrictions on metals have led Bjorksten Research Laboratories to experiment with polyethylene, vinyl chloride copolymer, and polyvinylidene chloride tubing for radiant floor heating; advantages claimed are freedom from corrosion and lower initial and installation costs (328). Another innovation is a vinyl sealing material which is applied by brush to seams of vinyl wall covering and dries in 5 minutes to give a durable, waterproof joint (329). Interesting new architectural applications of elastomeric vinyl extrusions and acrylic sheeting are to be found in the new research laboratory of S. C. Johnson & Son, Inc., in Racine, Wisconsin; the vinyl extrusions serve as separators for the glass tubes comprising the walls and the acrylic plastic forms the skylight dome (330).

Chemical—A major trend in the chemical industry is the use of plastics in the construction of corrosion-resistant equipment; added impetus in this direction is furnished by the present shortage of steel, copper, aluminum, and other metals. Tanks, hoods, vats, duct systems, and the like are being fabricated of a blend of high styrene resin and acrylonitrile rubber (331, 332) and rigid polyvinyl chloride (333). Chemical resistant containers are made of polyethylene (334), cellulose acetate (335), and acrylic and styrene resins (336), and pumps of urea-formaldehyde resins (337) and polyethylene (338). Acid and alkali-proof cements or mortars based on furfuryl alcohol resins are used in laying brick tank linings and floors in chemical plants (339-341). Protective clothing to guard personnel against hazardous chemicals is coated with polyvinyl chloride (342-344). Specialty applications of plastics, based on their chemical resistance, include armored vinyl tubing for beverages and gases (345), phenolic parts for a vegetable peeler (346), vinyl coatings for refinery equipment (347) and baking trays (348), a vinyl film cover for soil fumigation (349), and linings for electroplating tanks (350).

Coatings—Progress in the field of protective and decorative finishes, which now consume close to 600 million lb. of the synthetic resins produced annually in this country, was reviewed by two authors (351, 352). New developments in alkyds (353), phenolics (73), ureas (354), styrenes (355), and silicones (356, 357) for coatings were announced. A noteworthy report was published on the tropical performance of fungicidal coatings, which is a subject of considerable significance in connection with the protection of military equipment (358). Equipment and techniques were described for spraying high-solids latices of elastomeric polymers (359) and hot-spray lacquers (360).

Communications and Electronics—The TV formation in the home is reported to have been relegated to the minors as larger and larger television screens are turned out by ingenious molders of thermoplastics. One such is the 34-oz. polystyrene window for a Crosley set; the molding is protected from marring during plant transfer movements and shipping by a polyethylene envelope (361). Other recent contributions of plastics to television include Teflon spacers for coaxial cable transmission lines (362), polystyrene spacers for antenna lines (363), a phenolic insulator for the picture tube (364), acrylic and acetate filter disks for reception of color telecasts (365, 366), and a cast 22½-in. plastic lens for theater television projection systems (367). The Civil Aeronautics Administration is installing some 400 radomes made of glass fiber and polyester resin in its country-wide air navigation system; the domes are 7 ft. high and 8 ft. in diameter and weigh about 350 lb. each (368, 369). The diversified uses of plastics in railway signal equipment were reviewed (370).

A major innovation in the phonograph record industry occurred with the introduction of injection-molded styrene plastic records, which offer a competitive challenge to vinyl and shellac records in both speed of production and mold costs. The injection stamper will make approximately 60,000 reproductions, whereas the compression molds are limited to 500 to 800; in one plant an 8-cavity injection mold is turning out 700 records per hour (371). A great variety of plastics are used in the production of modern sound recording equipment (372-375).

Transistors comprised of a germanium rod encased in a 3/16-in. diameter styrene polyester bead, half the size of an average garden pea,

are a revolutionary development in the electronics industry. The transistor requires only a millionth of the wattage needed by its vacuum tube counterpart, yet can amplify electrical signals 100,000 times (376). Other significant developments in electrical uses of plastics include fabrication and impregnation of parts with polyester resins (377-380), miniaturization of equipment by the use of potting compounds (146, 265-268) and printed circuits (201), and new insulating materials for cables (381, 382). The theoretical background and present practices in the manufacture and use of electrets were reviewed (383). The experience and recommendations of the Underwriters Laboratories with respect to the uses of plastics in electrical equipment were reported on (384, 385).

Medical—Clinical research has established that certain plastics, notably polyethylene, acrylic, nylon, and some vinyls, are successfully tolerated by human tissue and bone structure. As a result some unusual prosthetic applications have been undertaken recently in which plastics have replaced brain membranes, lung tissues, bone structure, and heart valves and chambers (386). Vinyl plastics have found notable uses in surgical drapes (387), blood packs (388), model arms for training purposes (389), and bandages (390). Other applications of plastics in this field recorded during the year are hearing aids potted in polyesters (391), a mechanical heart fabricated from acrylic resin (392), radiotherapy equipment (393, 394), dental prostheses (395), and use in artificial hands (396).

Packaging—Nonfragile and chemical resistant, the sturdy squeeze-type polyethylene bottle has already become a major commercial product of the plastics industry, one which promises to set new records when the material is again available on an unrestricted basis. Design information of importance for such bottles including capacities and dimensions, neck, threads, colors, closures and their liners, spray fittings, and surface decoration, was published (397). Equipment for filling and assembling polyethylene spray containers was described (398). Collapsible tubes made of metal foil sandwiched between plastic films are assisting manufacturers of pastes and creams to continue full production in spite of metal shortages (399). Special plastic packages have been devised for foodstuffs (400), seafoods (401), paint pigments (402), drugs (403), chemicals (404), and plastic materials (405). Two unique packaging applications which have recently appeared are a polyethylene food bag strap (406) and a luminescent sealing tape (407).

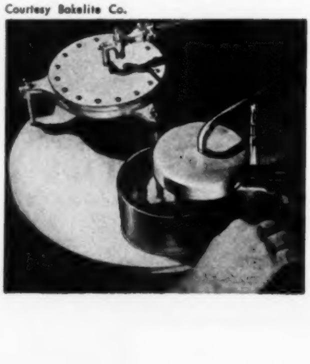
Marine and Automotive—The biggest polyester-impregnated glass cloth boat ever built, a 42-ft. sailing ketch, was launched during 1951 by Anchorage Plastics Corp.; this firm has constructed about 500 reinforced plastic boats since commencing operations in 1948 (408). A lifeboat constructed of polyester-mat with expanded cellulose acetate as a flotation element is under test by the U.S. Coast Guard (409). Inflatable vinyl boats of improved construction are on the market (410).

Improvements in automotive equipment based on utilization of plastic materials include an acrylic safety switch to cut off the ignition current in overturning vehicles (411), polyethylene spring liners to eliminate squeaks and grit (412), and panel and lamp sockets sealed against moisture and dust with vinyl plastisols (413).

Synthetic Fibers—The new textile fibers are joining coatings and adhesives as a major consumer of synthetic resins, the 1950 consumption being 145 million pounds (414-418). The growth curve is climbing steeply with plenty of altitude ahead in this 7 billion lb. U.S. industry, now made up roughly of 70% cotton, 10% wool, and 20% rayon. One expert predicts that "the history of increasing prices for natural products and decreasing prices along with extended applications of synthetics will undoubtedly be repeated in the case of fibers." The major synthetic fibers with present or projected plant capacities in millions of lb. annually are as follows: nylon, 96 with 50 more in construction; acrylonitrile (Acrilan, Dynel, and Orlon), 11.5 with 60 more underway; saran, 18; terephthalate polyester (Dacron), 35 projected; and zein (Vicara), 20-25.

Small objects can be reproduced in vinyl sheet by a swedging operation

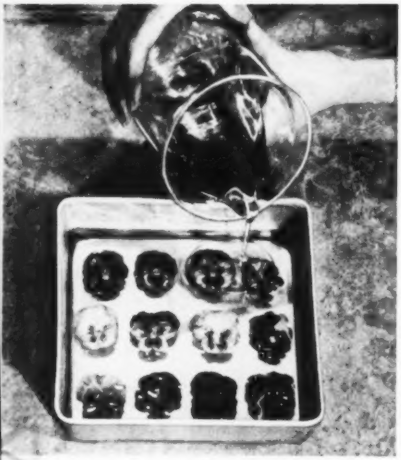
Courtesy Bakelite Co.



Miscellaneous—There were many outstanding examples of redesign of household and industrial machines to take advantage of the lighter weight, corrosion resistance, quieter operation, and lower costs of plastic parts. These included a room humidifier (419), a vacuum cleaner (420), an aerial camera (421), a meat slicer (422), and a counting device (423). Among the unusual applications of plastics described during the year were embossed vinyl movie screens such as the 36- by 50- ft. screen in Radio City Music Hall (424), rivets made of nylon, butyrate, ethyl cellulose, or polyethylene (425), a harp made with glass-fiber reinforced frame and nylon strings (426), phenolic laminate bearing shoes for the hand rail of a moving stairway (427), a molded butyrate rake (428), an ethyl cellulose housing for a radiosonde (429), vinyl bags for green house gardening (430), plant reproductions cast from vinyl plastisol (431), and archery bows made of laminated plastic (432). Other noteworthy developments were reported in the use of plastics in refrigerators (433-435), screening (436), lamp shades (437), tableware (438), rules and scales (439), safety glass (440), laminated gears (441), and foundry core driers (442).

Properties, Testing, Specifications

A highlight of the year on the technical side was the series of meetings of international groups concerned with plastics which met in New York during September. The International Union of Pure and Applied Chemistry led off on September 8-9 with meetings of its Commission on Macromolecules under the chairmanship of Professor Herman Mark, Brooklyn Polytechnic Institute, and the Division of Plastics and High Polymers under the chairmanship of H. V. Potter, Bakelite Ltd. These bodies are working



Pouring top layer of resin in process for embedment of flowers in polyester

on the standardization of chemical nomenclature, molecular weight determination, and analytical methods. During September 10-13 the XIIth International Congress of Pure and Applied Chemistry included sectional meetings on Elastomers and Plastomers under R. P. Dinsmore, Goodyear Tire & Rubber Co., and on Macromolecules under H. Mark. Symposia were held on rubber, coatings, glass and proteins, plastics, statistics of macromolecules and properties of their solutions, and copolymerization. On September 18-19, the first meeting of Technical Committee 61 on Plastics of the International Organization for Standardization was held with G. M. Kline presiding. With representatives from seven countries present, the committee initiated the important task of achieving agreement on testing methods and nomenclature for plastics, needed to facilitate trade between countries. Working parties were established to deal with strength properties, thermal properties, general chemical and physical properties, conditioning procedures, and nomenclature. Thus, the highly productive and indispensable technical activities in the plastics field carried on in this country by such organizations as the American Chemical Society, American Physical Society, American Society of Mechanical Engineers, American Society for Testing Materials, Society of Plastics Engineers, Society of the Plastics Industry, and others, are now to be supplemented by the efforts of these international groups in the promotion of mutual understanding and increased knowledge and utilization of plastics.

Many contributions were made during 1951 to the technical literature on the properties of plastic materials. The mechanical properties investigated included impact strength (443-449), creep (20, 21, 450), hardness (451), bending stiffness (452, 453), dynamic shear and modulus (454-458), viscoelastic and stress relaxation (459-464), and the effect on strength properties of low temperatures (465) and shape and molding conditions (466). Thermal properties which were reported on included transition temperatures (467), flammability (468, 469), and flow (470-475). Optical studies dealt with infra-red transmission (476), x-ray diffraction (477-479), refractive index (480), and fogging resistance (481). Electrical properties were covered in many outstanding contributions pertaining to electric moments (482). magnetic characteristics (483, 484), polyelectrolytes (485-491), electrolytic corrosion (492), arc resistance (493), dielectric strength (494, 495), and heat-resistant dielectrics (496). Permanence properties that were investigated included outdoor aging (497), fungus attack (498), chemical resistance (499), and degradation of polystyrene by ultrasonic waves (500-503) and cellulose by alkali (504). Other chemical and physical properties considered were absorption and transmission of water and organic vapors (505-509), compressibility at high pressures (510), surface tension (511, 512), swelling under strain (513), bulk factor (514), and thickness measurements (515, 516).

Analytical methods were reported for identification of coating materials (517), rubbers (518, 519), resins (520-522), and plasticizers (523). Methods were given for determining styrene monomer in polystyrene (524), methylol groups in phenol-, urea-, and melamine-formaldehyde compounds (525), resin content in polyvinyl chloride compositions (526). phthalic anhydride in alkyd resins (527), and resinous additions on papers and fabrics (528).

The fundamental structures of high polymers and the relationships between their moleculer architecture and thermodynamic properties were the subject of concentrated endeavors by scientists using the modern tools of osmometry (529-536), light scattering (537-541), ultracentrifugation (542-547), viscometry (548-559), and birefringence (560). The physicochemical and mechanical behavior of high polymers in solution was considered in other basic research reports (561-571).

Committee D-20 on Plastics of the American Society for Testing Materials prepared three new methods of test, pertaining to the measuring of bursting strength of round rigid plastic tubing (D 1180-51T), warpage in sheet plastics (D 1181-51T), and apparent density and bulk factor of granular thermoplastic molding powder (D 1182-51T). It revised seven methods covering conditioning (D 618-51T), repeated flexural stress (D 671-51T), long-time tension tests (D 674-51T), shrinkage from mold dimensions (D 955-51), determining temperatures of standard ASTM molds for test specimens (D 958-51), and recommended practices for molding specimens of phenolic materials (D 796-51) and amino plastics (D 956-51). Revisions of three specifications for molding compounds of the cellulose acetate (D 706-51T), cellulose acetate butyrate (D 707-51T), and melamine-formaldehyde (D 704-51T) types, new definitions of terms relating to plastics (D 883-51T), and specifications for molds for test specimens (D 647-51T) were also adopted (572).

Committee D-14 on Adhesives (573) prepared six new standards for determining strength development of adhesive bonds (D 1144-51T), the blocking point of potentially adhesive layers (D 1146-51T), the effect of moisture and temperature on adhesive bonds (D 1151-51T), effect of bacterial contamination on permanence of adhesive preparations and adhesive bonds (D 1174-51T), resistance of adhesives for wood to cyclic accelerated service conditions (D 1183-51T), and strength of adhesives on flexural loading (D 1184-51T).

References

1. "Defense machine tools up for plastics," Modern Plastics *28*, 87-93, 200-202, 205-206, 209 (June 1951).
2. "The promise of reinforced plastics in defense," Modern Plastics *28*, 55-59, 146, 149, 152, 155-156 (Mar.); 91-95 (Apr.); 64-67 (May 1951).
3. "Military specifications controlling plastic

(*Continued on p. 186*)

PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

General

CEMENTS. C. R. Payne. Ind. Eng. Chem. *43*, 2203-7 (Oct. 1951). Recent developments in adhesives, tank linings, and hydraulic cements are reviewed. Improved reinforced furan resin linings bonded to steel are serving as substitutes for corrosion-resistant metal alloys in the construction of reactors, tanks, towers, and fume ducts. Progress has been made in perfecting cold-setting epoxy resin cements for use in the electrical industry. Data are reported on the fundamental factors influencing the service life of acidproof brick linings and chemical properties of acidproof cements, and the new techniques of application developed to extend the range of their industrial uses. 105 references.

FIBERS. C. S. Grove, Jr., J. L. Vodonik, and R. S. Casey. Ind. Eng. Chem. *43*. 2235-8 (Oct. 1951). Recent developments in fibers are reviewed. Mobilization for possible war has somewhat disrupted the fiber economy by increasing the demand and partially curtailing production with various shortages. Part of the increased demand has been taken up by the increasing penetration of the man-made fibers into the total over-all fiber consumption. New and expanded plants and new fibers are expected to alleviate some of the shortages as new production begins. Modified fibers for special uses are becoming important factors in conserving fiber supply. 70 references.

POLYMERIZATION. C. C. Winding. Ind. Eng. Chem. *43*, 1997-2006 (Sept. 1951). The advances in polymerization during 1950 are reviewed. Activity in the principal applications of polymerization processes reached new highs in 1950, far outstripping 1949. The reactivation and remodeling of synthetic rubber plants got into high gear to stave off a threatened rubber shortage. Commercial production of the newer synthetic fibers became a reality along with the steady expansion of the older fibers. Plastics established new production peaks in spite of shortages of raw materials and plasticizers. The increase in coating resins was not as great but was still appreciable, even though scarcity of raw materials was acute. The number of publications dealing with polymerization increased by about 40% and showed a shift of interest from addition to condensation polymers, led by polyesters. 377 references.

Materials

A METHOD OF IMPREGNATING GELATIN WITH A PHENOL-FORMALDEHYDE RESIN. M. P. Blaber. Chem. & Ind. *1951*, 759-60 (Sept. 8, 1951). The synthesis of a phenol-formaldehyde resin suitable for impregnating photographic gelatin is described.

RUBBER-PHENOLIC MATERIALS FOR GREATER IMPACT STRENGTH. W. Goss. Product Eng. *22*, 137-41 (Jan. 1951). The properties of molded rubber-phenolic plastic molding compounds are described and compared with molded phenolic plastics. The principle advantage is in shock or impact properties, both static and dynamic.

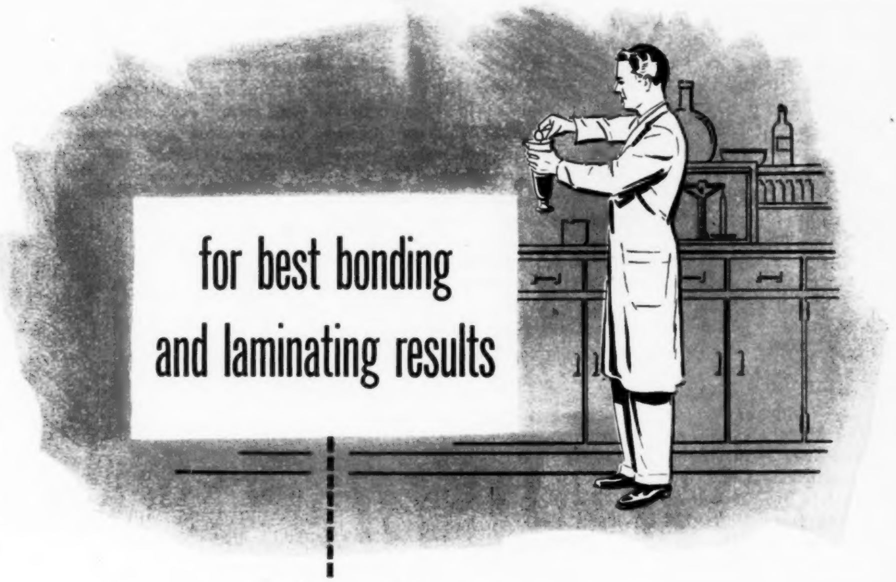
ENGINEERING PROPERTIES OF SILICONE RUBBERS. P. C. Servais. Mech. Engineering *73*, 639-43 (Aug. 1951). The properties and uses of silicone rubbers are reviewed. In general silicone rubber is most useful where the service life of organic rubbers is limited by abnormally high or low operating temperatures. It has also been used to simplify constructions that were originally complicated by the lack of thermal stability in organic rubbers. Typical of such applications are the use of silicone rubber to seal automotive transmission units, chlorinated diphenyl-filled capacitors, and push-rod-tube assemblies in aircraft and in air-cooled ordnance engine. Silicone rubber is also used in place of more complicated or less efficient metal constructions to seal high-altitude-aircraft doors and to prevent breakage by damping the vibration of the cooling vanes of aircraft engine cylinders. Furthermore, silicone rubber meets most of the requirements of an ideal dielectric. It combines the remarkable heat stability and moisture resistance of resinous silicone (Class H) insulating materials with the most desirable properties of rubber, including resilience, shock and abrasion resistance, and resistance to both mechanical and electrical fatigue. Silicone rubber is still an elastomer, however, and it cannot be expected to do more within its wider operating temperature span than organic rubbers can do within their narrower span.

POLYMERIZABLE DERIVATIVES OF LONG-CHAIN FATTY ACIDS. IV. VINYL ESTERS. W. S. Port, J. E. Hansen, E. F. Jordan, Jr., T. J. Dietz, and D. Swern. J. Polymer Sci. *7*, 207-20 (Aug.-Sept. 1951). Contrary to some published reports, the vinyl esters of saturated fatty acids polymerize readily and rapidly. Vinyl oleate, when present in excess of 5%, and oxygen exert marked retarding effects. Techniques are described for the free-radical-initiated polymerization of the vinyl esters of caprylic, capric, lauric, myristic, palmitic, and stearic acids in bulk, dispersion, solution, and emulsion. Some data are given for polymerization in the presence of chain-transfer agents, such as carbon tetrachloride, dodecylmercaptan, and ethylbenzene. Conditions are reported for obtaining degrees of polymerization from about 2 (when chain-transfer agents are employed) to 10,000 (weight average). The weight average degree of polymerization increases markedly as the conversion increases, particularly above 80%. Even up to extremely high conversions, soluble polymers are obtained in most cases. Solubility characteristics, transition point data, molecular weights (osmometric and light-scattering), and isolation and purification techniques are also reported on.

Molding and Fabricating

VINYL PLASTICIZERS. EFFECT ON PROCESSING POLYVINYL CHLORIDE IN BANBURY MIXERS. H. S. Bergen and J. R. Darby. Ind. Eng. Chem. *43*, 2404-12 (Oct. 1951). The rapid growth of plasticized vinyl compositions has necessitated the installa-

* Reg. U. S. Pat. Office.


for best bonding
and laminating results

tion of additional compounding equipment and the utilization of such equipment at the highest efficiencies. The Banbury mixer is the main compounding unit for fluxing vinyl compounds. Plasticizers are added to vinyl resins not only for the desirable properties they impart but also for improving processability. This article discusses the effect of different plasticizers, fillers, and lubricants on vinyl compounding in the Banbury mixer. Plasticizers exert a considerable effect on the fusion time of a vinyl compound. The plasticizers studied are broken down into five groups with respect to fusion ranges: 1) Plasticizers imparting very short fusion times: cresyl diphenyl phosphate, butyl benzyl phthalate, and alkyl aryl phosphate; 2) plasticizer imparting short fusion times: tricresyl phosphate; 3) plasticizers imparting moderate fusion times: dioctyl phthalate, and partially hydrogenated aromatic hydrocarbon (HB-40); 4) plasticizers imparting long fusion times: dioctyl ester of polyethylene glycol, dioctyl adipate, and fatty acid esters (P-4, THFO); 5) plasticizer imparting very long fusion times: polyester type (Paraplex G-50). The type of plasticizer used also has an effect on the power required for Banbury operation. In general, the faster the fusion time, the greater the horsepower requirement at either high or low rotor speed. Increasing lubricant concentration increases fusion time; however, with certain plasticizers, higher concentrations of lubricant may be tolerated without resulting in incompatibility or excessive fusion times. The effect of filler concentration on fusion times varies with the concentration of the filler.

LARGE PLASTICS PARTS. Electrical Manuf. *48*, 113-17, 306 (Oct. 1951). Equipment, technique, and molding compounds for molding large parts of plastics are discussed. A number of case histories are described.

PRESSURES DEVELOPED BY VISCOUS MATERIALS IN THE SCREW EXTRUSION MACHINE. W. T. Pigott. Trans. ASME 73, 947-55 (Oct. 1951). Previously developed equations describing the pressure and discharge rates of Newtonian liquids in the screw-type pump are discussed briefly and are experimentally verified. These equations are then applied to rubberlike materials for the two extreme conditions of extruder operation: Open discharge (with die removed from discharge end of extruder) and zero discharge (with solid plate sealing the discharge end of the extruder). For the condition of closed discharge, calculated pressures agreed with observed pressures, The apparent viscosities of a number of stocks were determined by forcing them through circular orifices at different flow rates and calculating the viscosity from Poiseuille's equation. The effective shear rate was calculated by using an expression for the average volume weighted rate of shear in circular orifices. The effective shear rate occurring in the extruder was calculated for screws with wide thread troughs from the velocity distribution in the troughs and an expression for the average volume weighted rate of shear in rectangular orifices. An experiment was devised to determine the effective shear rate in the extruder at zero discharge. The result agreed with the calculated value. It is concluded that at zero discharge the mechanism for rubberlike materials is one of viscous shearing and that rubberlike materials behave as viscous but highly thixotropic liquids.

Applications

DESIGN FACTORS IN BLOW-MOLDED PLASTIC BOTTLES. I. WHAT THE USER SHOULD KNOW IN MAKING A CHOICE OF PACKAGE FORMS IN THIS RAPIDLY DEVELOPING NEW ART. J. H. Parliman. Modern Packaging 25, 111-15, 120 (Oct. 1951). The standard sizes, designs, and applications of bottles made of plastics are described. The properties and applications of bottles made of polyethylene are discussed in detail. Bottles are also made of cellulose acetate, cellulose acetate butyrate, polystyrene, styrene-isobutylene copolymer, and polyisobutylene-polyethylene mixtures.

PLASTICS IN BUILDING. J. B. Singer. Plastics (London) 15, 184-6 (July); 212-14 (Aug.); 250-2 (Sept.); 278-9 (Oct.-Nov.-Dec. 1950); *16*, 10-11 (Jan.); 72-3 (Feb.); 100-101 (Mar.); 123-4 (Apr.); 165-6 (May); 235-6 (June); 262, 261 (Aug. 1951). The use of plastics in the construction of buildings is described in this series of articles. The topics considered include structural members, wall surfacing materials, translucent walls and partitions, roofing materials, piping, trim, plumbing, flooring, sound and thermal insulation, lighting fixtures, adhesives for wood, and the use of glass fiber reinforced plastic products.

WATERPROOF ADHESIVES FOR CELLULOSE. R. B. Dean. J. Colloid Sci. 6, 348-53 (Aug. 1951). The adhesion of formaldehyde-linked resins to cellulose films (cellophane) is still strong after soaking in water or alkali. It may even be increased by boiling. The adhesion of these resins appears to be due to the formation of covalent bonds between the resin and the cellulose, possibly by aldehyde formation in the cellulose followed by condensation with reactive groups in the resin.

DEVELOPMENT OF SYNTHETIC RESIN ADHESIVES FOR IMPROVED WOOD. I. ANILINE-FORMALDEHYDE RESINS IN PHENOLIC ADHESIVES. L. K. Dalton, J. S. Fitzgerald, G. W. Tack, and N. Tamblyn. Australian J. Applied Sci. 2, No. 1, 145-57 (1951). The effect of the addition of an aniline-formaldehyde resin to hot-setting phenolic adhesives of the cast and resol types was examined. With resin-impregnated laminated wood the joint strength increased for additions to both phenolic resins; with laminated fabric phenolic sheet there was an increase for the cast resin only; with mountain ash a decrease in strength with the resol. A commercial cool-setting cast phenolic adhesive gave the highest joint strength obtained with resin impregnated laminated wood, but the lowest with laminated fabric plastic. With both resins, higher proportions of formaldehyde gave better adhesives. Molecular ratios of formaldehyde to aniline of 1.25:1 or 1.5:1 gave a stronger bond than 1:1, and a ratio of formaldehyde to phenol of 2:1 was better than 1:1. Adhesives containing smaller proportions of aniline-formaldehyde resin gave the higher bond strengths. Proportions of aniline resin to phenolic resin of 1:4 were better than 1:2 or 1:1.

Properties

SPECTROMETRIC DETERMINATION OF REFRACTIVE INDEX AT LOW TEMPERATURES. R. H. Wiley and R. R. Garrett. J. Polymer Sci. 7, 121-31 (Aug.-Sept. 1951). A spectrometric tech-

nique for the determination of refractive indices of liquids and polymers over a temperature range of -70 to $+70$°C. was developed and used to establish the absolute accuracy, within ± 0.0004 refractive index units, of a more convenient refractometric method previously described. Refractive index values are reported for dimethyl phthalate from $+70$ to $+15$°C.; polyvinyl acetate from $+65$ to -70°C.; and tricresyl phosphate from $+30$ to -80°C. The refractometric values are within ± 0.0004 or less units of the spectrometric values over this range. The data for tricresyl phosphate locate two apparent second order transitions at -47 and at -62°C. The higher value (-47°C.) is observed with thoroughly dried tricresyl phosphate.

Corrosion Experiments with Gaseous Boron Trifluoride. F. Hudswell, J. S. Nairn, and K. L. Wilkinson. J. Applied Chem. *1*, 333-6 (Aug. 1951). There is no appreciable attack by boron trifluoride on any of the metals or alloys examined at temperatures up to 200°C. Below this temperature there does not appear to be any decomposition of the gas itself. Among the miscellaneous materials, Pyrex glass, amorphous carbon, graphite, and fired pyrophyllite show a high resistance to attack. A number of the plastic materials are also resistant, but others have been found quite unsuitable when they are used in contact with boron trifluoride.

Comparative Strengths of some Adhesive-Adherend Systems, N. J. Delollis, N. Rucker, and J. E. Wier. Trans. ASME *73*, 183-93 (Feb. 1951). The strength properties of various adhesive - adherend combinations were determined as one phase of an investigation of the nature of adhesion. The adhesives were polyvinyl acetate, cellulose nitrate, resorcinol resin, casein, gum arabic, natural rubber, and neoprene. The adherends were stainless steel, aluminum alloy, paper - phenolic laminate, glass, birchwood, and hard rubber. The properties studied were double-lap shear, tensile, long-time loading shear, and impact strengths. The tensile-adhesion and shear-strength values for a given adhesive-adherend combination did not differ greatly except for wood and paper-phenolic laminate, which are nonisotropic.

The highest values (up to 3600 p.s.i.) were obtained with polyvinyl-acetate and cellulose-nitrate adhesives. The thermosetting resorcinol resin showed no appreciable flow in supporting a load of 680 p.s.i. for 6 months, whereas the thermoplastic polyvinyl acetate failed in 45 days under a load of 200 p.s.i. The rubber-type adhesives, which were weak compared with the other adhesives in the static load tests, were definitely superior in the impact tests. Better correlation of shear strengths was observed with the moduli of elasticity than with the dielectric constants of the materials used in the various adhesive-adherend combinations.

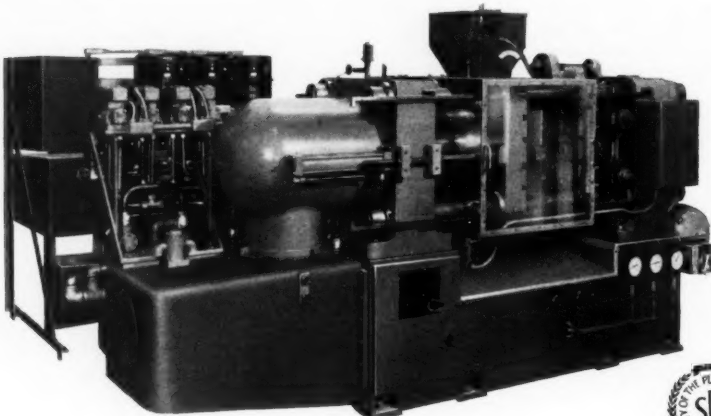
Testing

Shock Loading of Plastics. P. H. Ericksen. SPE J. 7, 7-9 (Oct. 1951). The types of impact or shock tests used to evaluate plastics are reviewed here.

Measurement of the Dynamic Modulus of Elastomers by a Vector Subtraction Method. C. W. Painter. ASTM Bulletin No. 177, 45-7 (Oct. 1951). A new method for measuring the dynamic modulus and hysteresis of elastomers is described. Several variables in procedure were studied. Typical results are reported.

An Impact Test for Miniature Plastics Specimens. H. W. Woodham, M. G. Wirick, and W. H. Markwood, Jr., ASTM Bulletin No. 177, 48-50 (Oct. 1951). A single-blow falling-weight testing machine is described for determining the impact resistance of miniature injection molded, notched specimens of experimental plastics when only small quantities (20 to 50 g.) of molding powder are available. A steel cantilever beam, with the test specimen clamped to its free end, is displaced by the impact blow which fractures the specimen. As a result of this displacement, an e.m.f. is induced by the movement of a permanent magnet through a solenoid and recorded as a single trace on a cathode-ray oscillograph. The square of the oscillograph trace height is a function of the energy transmitted to the cantilever and, hence, a measure of the impact resistance of the specimen. By an empirically derived correlation curve, the result may be converted to ASTM Izod units.

JC new 16 oz. horizontal



ELECTRIC AUTO-LITE CO. INSTALLATION IN CONTINUOUS OPERATION—24 HOURS A DAY

THE NEWEST development of the Plastics Division of Jackson & Church— a screw type 16 oz. horizontal injection press featuring J-C's Hendry Pre-Plasticizing Process—is now in continuous and successful operation at Electric Auto-Lite Co., Bay City, Michigan.

The result of extensive research and experimentation, the J-C 16 oz. horizontal press utilizes such famous J-C design features as variable pitch screw, multi-stage extruder screw, single zone injection chamber holding 17 oz. of constant-temperature viscous material, and hydraulically operated injection ram.

Plasticizes 180 pounds of styrene per hour with pressure exerted on the material in the injection chamber of 14,000 p.s.i. Locking pressure on the clamp is 225 tons.

U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

COPOLYMERS. H. L. Pfluger (to Quaker Chemical Products). U.S. 2,565,147, Aug. 21. Process for hydrolyzing copolymers of maleic acid derivatives.

PLASTIC WELDING. R. M. Wilmotte, H. J. Cameron, and L. L. Young (to R. M. Wilmotte). U.S. 2,565,161, Aug. 21. High frequency dielectric welding system for thin thermoplastic sheets.

RESINS. J. C. Bacon and W. F. Hart (to American Cyanamid). U.S. 2,565,194, Aug. 21. Condensate of an aldehyde with the reaction product of a chlorotriazine and an amine of a drying oil.

COUMARONE-INDENE RESINS. L. M. Geiger (to Neville). U.S. 2,565,222, Aug. 21. Process for production of resin dispersions having uniform particle size.

MOLDING. F. Lyijynen (to Briggs). U.S. 2,565,248, Aug. 21. Plastic molding apparatus.

UREA RESINS. T. J. Suen and A. M. Schiller (to American Cyanamid). U.S. 2,565,278, Aug. 21. Water-soluble amino-pyridine modified urea-aldehyde resin.

SEALING ELEMENTS. G. R. Lucas and R. C. Bryan (to G.E.). U.S. 2,565,316-7, Aug. 21. Polyvinyl chloride with a temporary plasticizer capable of swelling in a dilater liquid.

PENTADIENE COPOLYMERS. H. G. Schutze (to Standard Oil). U.S. 2,565,398, Aug. 21. Oxidation-resistant 4-methyl-1,3-pentadiene tertiary-mono-olefin copolymers.

MOLDING. W. S. Renier (to Giddings and Lewis Machine Tool). U.S. 2,565,522, Aug. 28. Discharge nozzle for plastic molding machine.

SILICON FOAMS. J. B. Rust and L. Spiatler (to Montclair Research and Ellis-Foster). U.S. 2,565,524, Aug. 28. Silicone froth.

RESIN. A. R. Welch and O. G. Morris (to O. G. Morris). U.S. 2,565,538, Aug. 28. Composite melamine-aldehyde, phenol-aldehyde, alkyd resin.

ION EXCHANGE. M. DeGroote and B. Keiser (to Petrolite). U.S. 2,565,549-50, Aug. 28. Cation-active polychloride containing an esterified polyaminoether.

RESIN. E. M. Geiser (to Universal Oil Products). U.S. 2,565,654, Aug. 28. Resinous elastomeric vegetable oil-hydrocarbon oil-carbonyl compositions.

RESIN. M. T. Harvey (to Harvel Research). U.S. 2,565,685, Aug. 28. Drying oil-furfural-mesityl oxide compositions.

POLYMERIZATION. F. L. M. Schouteden and R. G. Tritsmans (to Gevaert Photo-Production). U.S. 2,565,783, Aug. 28. Polymerization of unsaturated compounds with a catalyst mixture.

RESIN. J. D. Garber and D. W. Young (to Standard Oil). U.S. 2,565,960, Aug. 28. Copolymerization of hydrocarbons in the presence of Friedel-Crafts catalyst.

POLYMERS. J. R. Caldwell (to Eastman Kodak). U.S. 2,566,162, Aug. 28. Acrylyl sulfanilamide polymers.

POLYMERS. W. F. Fowler, Jr., and W. O. Kenyon (to Eastman Kodak). U.S. 2 566,184, Aug. 28. Deesterified vinyl hydrosols becoming insoluble upon water evaporating from them.

CASTING. G. D. Hiatt and H. N. Jarvis (to Eastman Kodak). U.S. 2,566,199, Aug. 28. Cellulose ester mold casting composition.

COPOLYMERIZATION. J. B. Hyman (to Catalin). U.S. 2,566,206, Aug. 28. Copolymerization of a polyester composition with a mixture of peracetic acid and another peroxide.

COPOLYMER. P. S. Pinkney (to Du Pont). U.S. 2,566,244, Aug. 28. Ethylene-vinyl alcohol-acrylic acid copolymers.

POLYMERS. D. R. Reynolds and W. O. Kenyon (to Eastman Kodak). U.S. 2 566,250, Aug. 28. Lactam-containing polymers.

COPOLYMERS. L. M. Richards (to Du Pont). U.S. 2,566,251, Aug. 28. Copolymers of aliphatic conjugated diolefin hydrocarbons with polymerizable vinyl carboxylates.

INTERPOLYMERS. A. F. Smith and H. B. Stevenson (to Du Pont). U.S. 2,566,255, Aug. 28. Partially hydrolyzed interpolymers of acrylonitrile with vinyl esters.

POLYMERS. W. J. Wayne (to Du Pont). U.S. 2 566,268, Aug. 28. Polymeric esters of natural drying oil fatty acids.

MOLDING. H. E. Robinson (to P. J. LoBue). U.S. 2,566,293, Aug. 28. Machine for injection or extrusion of plastics.

COPOLYMERS. C. F. H. Allen and J. A. Van Allan (to Eastman Kodak). U. S. 2,566,302, Sept. 4. Copolymers of cinnamoyl-vinyl aromatic hydrocarbons.

POLYMERIZATION. L. Schmerling (to Universal Oil Products). U. S. 2,566,537-8, Sept. 4. Peroxide catalyzed polymerization of ethylene in the presence of a phenol or an amine at elevated pressure.

POLYSTYRENE. H. M. Hutchinson and J. P. Staudinger (to Distillers). U. S. 2,566,567, Sept. 4. Production of polystyrene.

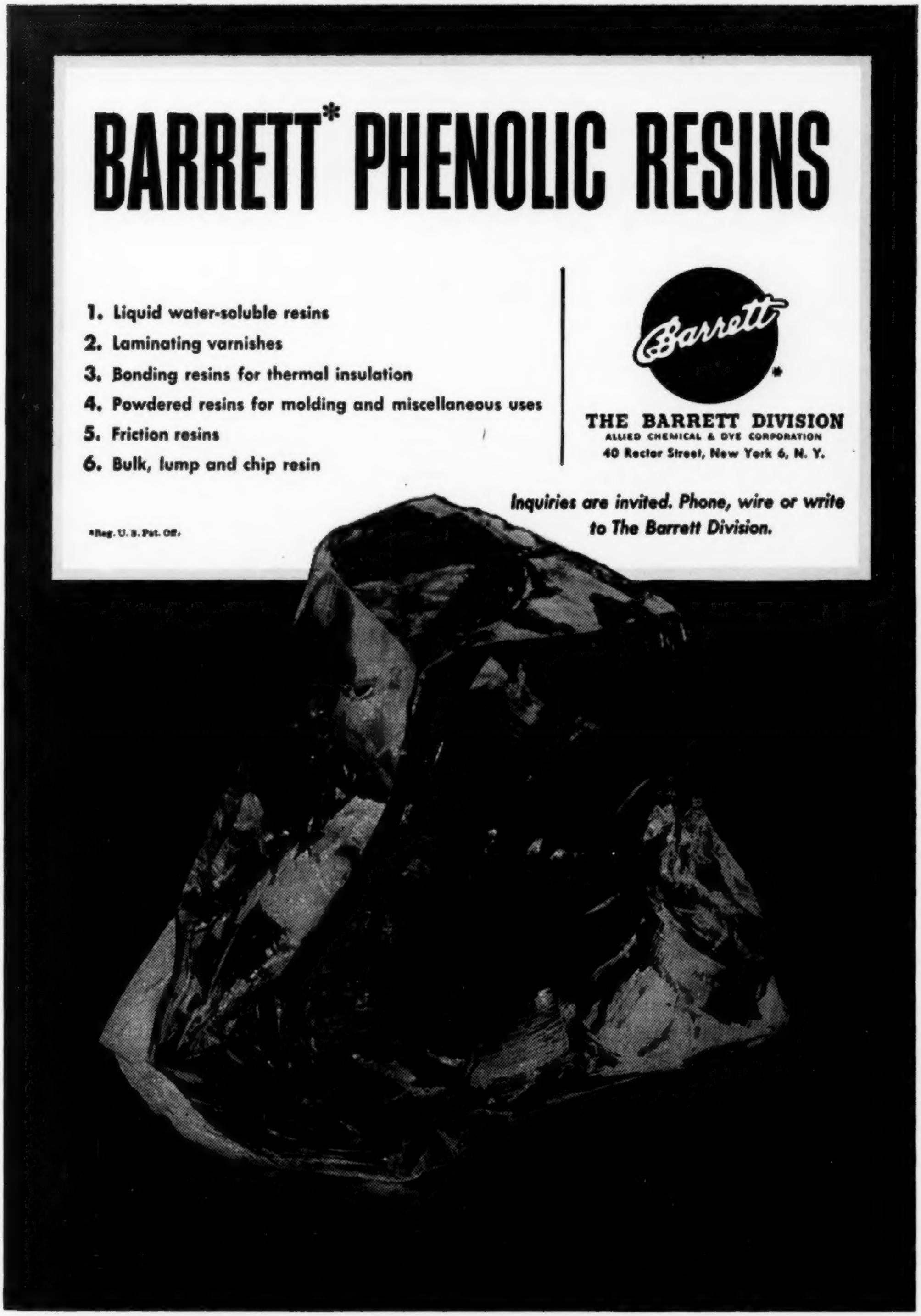
MOLD. R. J. Renholts (to Friden Calculating Machine). U. S. 2,566,636, Sept. 4. Compound die for fastening an insignia of hardenable plastic to a perforated article.

POLYTHIOUREAS. A. S. Carpenter, S. Coldfield, and D. L. Wilson (to Courtaulds). U. S. 2,566,717, Sept. 4. Reacting carbon disulfide with a primary diamine to produce fiber-forming polythioureas.

STABILIZER. C. J. Chaban (to Stabelan Chemical). U. S. 2,566,791, Sept. 4. Polyvinyl chloride plasticized with butadiene-acrylonitrile, stabilized with sodium thiosulfate.

PHENOLIC RESINS. E. E. Novotny and G. K. Vogelsang (to Borden). U. S. 2,566,851, Sept. 4. Intercondensates of a mixture of furane-aldehyde, a non-furane-aldehyde, and a phenol.

MOLDING. G. B. Sayre (to Boonton



BARRETT* PHENOLIC RESINS
1. Liquid water-soluble resins
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Inquiries are invited. Phone, wire or write to The Barrett Division.
*Reg. U. S. Pat. Off.

Molding). U. S. 2,566,857, Sept. 4. Automatic control for transfer molding.

MINERAL FIBER MAT. T. E. Philipps (to Owens-Corning Fiberglas). U. S. 2,566,960, Sept. 4. Glass fiber mat bonded with polystyrene.

EMBOSSING. H. S. Clemens and R. E. Thomas (to Du Pont). U. S. 2,566,982, Sept. 4. Process for embossing vinyl resin film.

RUBBER. A. M. Gessler and A. F. Sayko (to Standard Oil). U. S. 2 567,016, Sept. 4. Hydrocarbon rubber plasticized with a polyvinyl ether or polyester.

SUPERESTERS. S. M. Livengood (to Carbide and Carbon). U. S. 2,567,076, Sept. 4. Production of polyoxyethylene glycol waxy, water-soluble polymers.

POLYMERS. S. Hochberg (to Du Pont). U. S. 2,567,108, Sept. 4. Coating of chromic acid and a homopolymer of ethylene.

POLYMERS. E. G. Howard, Jr. (to Du Pont), U. S. 2,567,109, Sept. 4. In addition polymerization, contacting the monomer with an aqueous dispersion of titanous ion and a hydroxylamino compound.

SILOXANES. J. F. Hyde (to Corning Glass Works). U. S. 2,567,110, Sept. 4. Preparation of organopolysiloxanes by reaction of salts of silanols with halosilanes.

ORGANOSILICON POLYMERS. J. L. Speier (to Dow Corning). U. S. 2,567,131, Sept. 4. Organosilicon polymers.

INTERPOLYMERIZATION. L. E. Wakeford, D. H. Hewitt, E. Booth, and R. H. Buckle (to Sherwin-Williams). U. S. 2,567,137, Sept. 4. Interpolymerization of styrene and frosting drying oil in the presence of monocyclic alpha-terpene.

MOLDING. W. P. Consino (to Chrysler). U. S. 2,567,147, Sept. 4. Lubricating injection molding apparatus.

DICYANDIAMIDE RESIN. L. Sellef and W. O. Dawson (to Jacques Wolf). U. S. 2,567,238, Sept. 11. Dicyandiamide-formaldehyde resins.

PLASTIC TREATMENT. R. Colombo. U. S. 2,567,274-5, Sept. 11. Apparatus for kneading and goffering thermoplastic materials.

AIR-DRYING RESINS. P. O. Tawney (to U. S. Rubber). U. S. 2,567,304, Sept. 11. Soluble, unsaturated, air-drying interpolymers of 2-alkenoxyalkyl esters of alpha-olefinic monocarboxylic acids with 2-alkenyl compounds.

RESIN. L. C. Morris (to Phillips Petroleum). U. S. 2,567,342, Sept. 11. Hydrogenating an acid-soluble oil fraction in the presence of hydrofluoric acid.

SAFETY GLASS. J. D. Ryan (to L.-O.-F.). U. S. 2,567,353, Sept. 11. Safety glass laminated with polyvinyl butyral resin.

COPOLYMERS. K. E. Marple and E. C. Shokal (to Shell Development). U. S. 2,567,675, Sept. 11. Copolymers of non-aromatic unsaturated esters of ethereal oxy acids.

MOLDING. L. M. Grimes. U. S. 2,567,704, Sept. 11. Extrusion head for forming plastic sheet.

RESINS. L. S. Moody (to G.E.). U. S. 2,567,724, Sept. 11. Polysilthianes.

POLYMERIZATION. P. Castan and O. Hagger (to Gebr. de Trey). U. S. 2,567,803, Sept. 11. Polymerization of vinyl compounds in the presence of a sulfinic acid catalyst.

ION EXCHANGE. J. A. Anthes (to American Cyanamid). U. S. 2,567,836, Sept. 11. Polymers of quaternized acrylamido anion exchangers.

POLYVINYL CHLORIDE. W. E. Field (to Monsanto). U. S. 2,567,905, Sept. 11. Fungi and bacteria resistant polyvinyl chloride compositions.

POLYVINYL CHLORIDE. R. W. Malone, Jr. (to Monsanto). U. S. 2,567,910, Sept. 11. Fungi and bacteria resistant polyvinyl chloride.

RESIN. S. G. Burroughs (to Pennsylvania Industrial Chemical). U. S. 2,567,916-7-8-9, Sept. 18. Copolymer dipentene - vinylcyclohexene resin; copolymer beta-pinene, rearranged-alpha pinene, and vinyl cyclohexene resins.

TISSUE PRESERVATION. G. R. Fessenden. U. S. 2,567,929, Sept. 18. Preservation of plant tissues with solvent, non-oxidizing acid, chlorinated hydrocarbon, and a resin.

SPONGES. W. R. Stauffer (to Commonwealth Engineering). U. S. 2,567,950, Sept. 18. Using sodium silico fluoride impregnated with ni-

trous oxide as a foaming agent for resin sponges.

POLYMERIZATION. W. T. Miller (to U. S.). U. S. 2,567,956, Sept. 18. High pressure polymerization of perhaloolefins.

EXTRUSION. W. R. Myers and A. S. Tennant. U. S. 2,567,960, Sept. 18. Plastic extrusion gun.

MOLDING. V. Vltavsky. U. S. 2,568,-042, Sept. 18. Injection molding press.

RESINS. S. G. Burroughs (to Pennsylvania Industrial Chemical). U. S. 2,568,216-7, Sept. 18. Resins from vinyl cyclohexene with turpentines and camphene.

RESIN. T. G. Woolhouse and W. Lunn. U. S. 2,568,313, Sept. 18. Resins from an aldehyde and an aromatic hydrocarbon.

COPOLYMERIZATION. V. J. Frilette. U. S. 2,568,331, Sept. 18. Using an alkali earth oxide as a catalytic booster for copolymerizing styrene and unsaturated polyester.

CONDENSATES. R. R. Whetstone, W. J. Raab, and S. A. Ballard (to Shell). U. S. 2,568,426, Sept. 18. Condensates of polyethylenic-unsaturated aldehyde adducts and an aluminum lower alkoxide.

RESIN. E. D. Lee and R. J. Schefbauer, Jr. (to Interchemical). U. S. 2,568,591, Sept. 18. Utah coal resin-modified alkyd resin.

POLYMERS. J. A. Bralley (to B. F. Goodrich). U. S. 2,568,608, Sept. 18. Polymers of polyunsaturated nitrogen-containing compounds.

COPOLYMERS. C. I. Parrish (to B. F. Goodrich). U. S. 2,568,656, Sept. 18. Copolymers of an isoolefin and a vinyl cycloolefin.

POLYESTERS. F. B. Pope (to B. F. Goodrich). U. S. 2,568,658, Sept. 18. Polymerizing unsaturated polyesters with an unsaturated monomer.

INTERPOLYMERS. J. N. Powell, Jr. (to B. F. Goodrich). U. S. 2,568,659, Sept. 18. Interpolymers of an alkyl acrylate, a haloalkyl vinyl compound, a divinyl aryl hydrocarbon.

COPOLYMERS. F. E. Condo and M. Naps (to Shell). U. S. 2,568,692, Sept. 25. Copolymers of vinyl halides and halogenated propenes.

RESINS. W. H. Kirkpatrick and E. T. Kocher (to Visco Products). U. S. 2,568,747, Sept. 25. A modified alkyd resin derived from a polycarboxy organic acid, a mixed ester, and an alkylol amine.

POLYMERS. W. H. Woodstock (to Victor Chemical). U. S. 2,568,784, Sept. 25. Polymeric reaction products of olefin oxides with phosphoric anhydride.

POLYMERS. P. O. Tawney (to U. S. Rubber). U. S. 2,568,872. Sept. 25. Unsaturated copolymers of di-2-propenyl phthalates.

POLYMERS. H. Dreyfus (to Celanese). U. S. 2,568,885, Sept. 25. Manufacture of high polymeric compounds from N,N′-dicarbophenoxy-2,4-diaminotoluene and hexamethylene glycol.

POLYMERIZATION. R. B. Thompson and L. Schmerling (to Universal Oil Products). U. S. 2,568,902, Sept. 25. Beta-thioethyl-substituted carbonyl compounds as modifiers in ethylene polymerization.

MOLDING. R. H. Weihsner (to Tabor Manufacturing). U. S. 2,568,-905, Sept. 25. Clamp for mold.

MOLDING. N. Fienberg and A. R. Calder (to A.C.I. Plastics). U. S. 2,568,956, Sept. 25. Finishing apparatus for plastic moldings.

VINYL CHLORIDE. E. E. Cowell and J. R. Darby (to Monsanto). U. S. 2,568,989, Sept. 25. Stabilized vinyl chloride polymer compositions.

MOLDING. J. H. Wilhelm (to Conmar Products). U. S. 2,569,083, Sept. 25. Method and apparatus for molding and trimming.

POLYMERS. M. Markarian (to Sprague Electric). U. S. 2,569,131, Sept. 25. Polymers of pentachlorostyrene.

MOLDING. L. Kardorff (to Automatic Injection Machines). U. S. 2,569,174, Sept. 25. Thermoplastic injection molding apparatus.

RESINS. H. R. Fleck and G. B. E. Schueler. U. S. 2,569,301, Sept. 25. Thermosetting resins prepared by treating wallaba resin with furfural.

POLYSTYRENE. J. M. Butler (to Monsanto). U. S. 2,569,400, Sept. 25. Reacting polystyrene with an unsaturated compound in the presence of hydrogen fluoride.

COPOLYMERS. J. Dazzi (to Monsanto). U. S. 2,569,404-5-6-7, Sept. 25. Vinyl chloride polymers plasticized with esters of (1′,2′-dicarboxyethyl)octadecenoic acid and (1′,2′-dicarboxyethyl)undecylenic acid.

COPOLYMERS. H. J. Hagemeyer, Jr., E. L. Oglesby, and J. R. Caldwell (to Eastman Kodak). U. S. 2,569,470, Oct. 2. Copolymer of acrylonitrile and polyvinyl acetate hydrolyzed to the extent of 20 to 50%.

RESINS. A. E. Rheineck (to Hercules). U. S. 2,569,495, Oct. 2. Hard resins from pentaerythritol-rosin acid ester and alpha,beta-unsaturated polycarboxylic acid ester.

POLYMERIZATION. E. J. Vandenberg (to Hercules). U. S. 2,569,506, Oct. 2. Emulsion polymerization of vinyl compounds using a mercaptan modifier, a hydroperoxide catalyst, and oxygen.

POLYMERIZATION. J. M. Hamilton, Jr. (to Du Pont). U. S. 2,569,524, Oct. 2. Polymerization of trifluorochloroethylene in the presence of silver ion, bisulfite ion, and persulfate.

MOLDING. E. C. Quear, W. C. Shaw, and J. R. Edwards (to General Motors). U. S. 2,569,535, Oct. 2. Apparatus for molding thermoplastic materials.

CONDENSATES. F. B. Stilmar (to U. S.). U. S. 2,569,644, Oct. 2. Highly fluorinated condensates prepared from a chlorofluoro organic compound in the presence of a metallic copper catalyst.

DENTAL MATERIAL. F. E. Knock (to L. D. Caulk). U. S. 2,569,767, Oct. 2. Dental forming mixture of methyl methacrylate, the polymer thereof, dichlorostyrene, and a peroxy catalyst.

MOLDING. J. V. Bertrand and G. S. Shaw (to Hydropress). U. S. 2,569,-919, Oct. 2. High frequency dielectric heating chamber in a plastic molding machine.

INTERPOLYMER. E. F. Izzard (to Du Pont). U. S. 2,569,932, Oct. 2. Cross-linked hydrolyzed interpolymer of vinyl acetate and allylidene diacetate.

RESIN. P. O. Tawney (to U. S. Rubber). U. S. 2,569,959-60, Oct. 2. Acetone-soluble copolymer of a di-2-alkenyl itaconate and a 2-alkenyl chloride.

NEW MACHINERY AND EQUIPMENT

Envelope Vacuum Sealer—A new envelope vacuum sealer, designed to automatically vacuumize and heat-seal pre-product-packed plastics film bags for the packaging of food products, has been announced by Standard-Knapp Div., Emhart Mfg. Co., Portland, Conn. Handling up to 15 to 18 bags per minute, depending upon product size, the machine produces uniformly leak-proof seals. The automatic heat sealing cycle has pre-set controls for type and weight of film used. Spreader bars, which eliminate wrinkles at the seal line, permit adjustability of plus 3 in. from normal bag size with a bag size range of 5 to 18 in. at bag mouth. Weighing about 750 lb., the machine requires a minimum of floor space, the dimensions being 35 to 36½ by 50⁵⁄₁₆ inches.

Strain Tester—An instrument to perform elongation tests on rubber and other high elastomers in accordance with methods developed by the National Bureau of Standards is now being produced by Scott Testers, Inc., Providence 3, R.I. The tester employs a mechanical method of additive weight loading, thus eliminating the use of electrical circuits which are subject to poor performance under the climatic conditions common to rubber producing areas. The machine is equipped with a buzzer that automatically sounds when any malfunction of the test has made the observed results erroneous.

High Pressure Pump—Designed as a heavy-duty packaged hydraulic power generator for all types of hydraulic power systems, a compact high pressure triplex pump is now being manufactured by Kobe, Inc., Div. of Dresser Equipment Co., Huntington Park, Calif. The unit is available in 15, 30, and 50 hp. sizes with pressure ratings up to 5000 p.s.i. and displacement ratings up to 60 g.p.m. There are also special 10,000 and 20,000 p.s.i. heads. Special features of the completely enclosed pump include integral gears, available in a wide variety of ratios, and built-in pressure lubrication with pressure gage, relief valve, and scavenger pump. Plungers and liners are interchangeable, providing a variety of pressure-volume ratings for each unit. Spring loaded balls and hardened-and-ground seats serve as inlet and outlet valves. Originally designed as a power source for a hydraulic oil well pumping system, the unit has now attracted the interest of hydraulic engineers in other industries.

Non-Fusing Cutter—The costly problem of fusing, which arises when multiple layers of synthetic fabrics and some plastic-coated and plastic film materials are cut, is claimed to be eliminated in a new straight-knife cutting machine designed by H. Maimin Co., Inc., 571 Eighth Ave., New York 18, N. Y. This has been accomplished by keeping the operating speed of the cutter down to half that of other fabric cutters. Despite the fact that this slower blade speed reduces cutting speed, the manufacturer points out that overall production time is saved because there is no fusing of the material being cut. Further, the blade runs so cool that cooling liquids are not needed.

Maimin cutters, available with 4-, 5-, or 6-in. blades, also offer such advantages as: a lever that shifts to permit rough or smooth knife edge; emery stones for sharpening; and a knife locking mechanism that holds blade back on slot.

Compound Mixer—Viscous plastics compounds, heavy chemical solutions, or solids suspended in a heavy liquid vehicle can be processed and blended in a heavy duty A.S.M.E. mixer produced by L. O. Koven & Brother, Inc., 154 Ogden Ave., Jersey City 7, N. J. The 36-in. diameter mixer, welded for vacuum operation, has a full steam jacket for heating during mixing. The cover is provided with an 11- by 15-in. hinged manhole and a 4-in. sight glass.

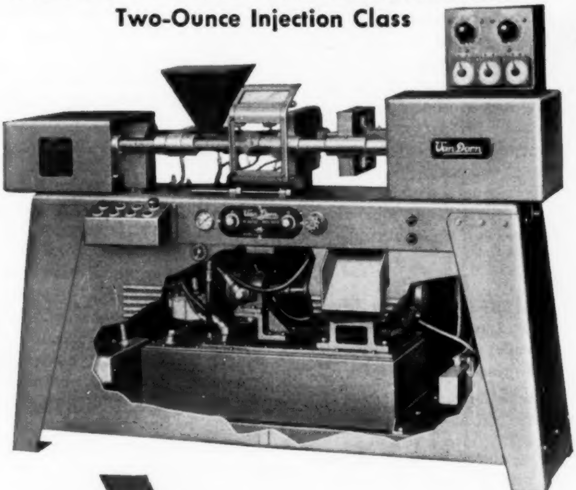
An 18-in. diameter turbine-type impeller is driven at about 125 rpm. by a 2-hp. explosion-proof motor through a speed reducer. To augment the impeller, three baffles are equally spaced in the tank. Material being handled goes through a continuous suction, dispersion, kneading, and shearing cycle which rapidly disintegrates and distributes uniformly any solids in the vehicle—or homogeneously mixes fluids of dissimilar gravity and viscosity.

Edge-Matching Tool—A new flush-jointing tool for finishing operations on laminated plastic tops has been announced by North American Products Co., 3100 West Cherry St., Milwaukee 8, Wis. The carbide-tipped tool enables the jointing operation to be accomplished in portable hand router machines instead of on table type shaper and jointer machines. The edges of the laminated sheet overhanging the core and the excess glue can be removed in one sweep of the tool, leaving the smooth square-cut edge for close fitting of trim moldings or for butt jointing. A precision ball bearing guide prevents burning or scratching. The tool, available in ¼, ⁵⁄₁₆, ⅜, and ½ in. shank sizes, can also be used as a frizzing tool for solid plastic parts.

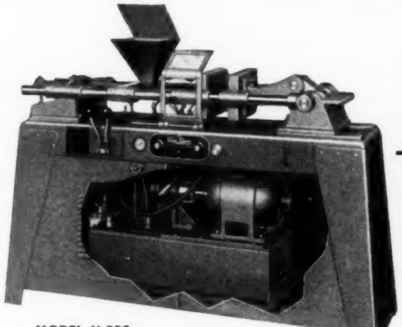
Micrometer—Rapid and accurate measurement to a tolerance of 0.00002 in. is claimed for a new micrometer being manufactured by J. W. Dice Co., 1 Engle St., Englewood, N.J. An electronic circuit, sufficiently sensitive to give a positive indication with only five millionths of an inch displacement at the contact, coupled with an extremely accurate micrometer head, permits "pressureless" measurement. The instrument is unaffected by vibrations, variations in temperature or line voltage, or aging of electronic tubes. The several models available with different work capacities can be used to measure compressible or non-compressible materials, whether conductive or non-conductive. The micrometer can also measure deflections in diaphragms, springs, bellows, and similar applications requiring measurement without pressure.

Produce Plastics Profitably With This
VAN DORN Equipment

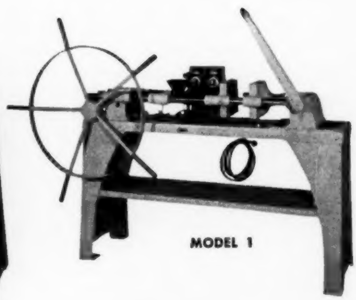
Model H-200—Leader in the Semi-Automatic Two-Ounce Injection Class



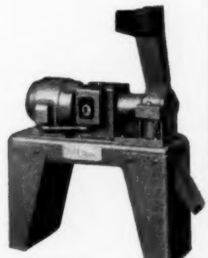
This ultra-modern press molds practically all thermoplastics including nylon. It completes up to 6 operating cycles per minute. Push button controls are safe, simple and convenient. Compact and rugged, the unit is quiet and economical in operation. Sliding gate with interlocking safety devices starts the cycle. Solenoid valves close the molds. Injection and dwell are controlled by first of three timers on the rear panel. Center timer regulates recharging of heater. The third timer controls the length of the mold close cycle; when time runs out, molds automatically open and parts are ejected. Operator opens safety gate, removes product and then closes gate to begin the next cycle . . . Variable voltage transformers in conjunction with thermostatic units control the temperatures on the two heating zones accurately.



MODEL H-200



MODEL 1



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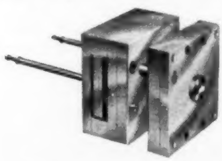

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Plastics Progress: Papers and Discussions at British Plastics Convention 1951"

Published in 1951 by Iliffe and Sons, Ltd., Dorset House, Stamford St., London, S.E.1. 310 pages. Price 50s

Composed of a collection of papers and lectures given at the British Plastics Convention, 1951, on recent developments in the technology of plastics, this book demonstrates the growing importance of plastics in various industrial and other nonconsumer applications, ranging from textiles, aircraft, automobiles, and ships to building and architecture, chemistry, packaging, surgery, and medicine. Other topics covered include: vinyl formulation and compounds; developments in synthetic resins; synthetic fibers; plastics film production and handling; techniques of fabrication; and the buying and selling of plastics.

"Australian Plastics Year Book 1951"

Published in 1951 by Australian Trade Publications Pty., Ltd., 171 Sussex St., Sydney, N.S.W., Australia. 144 pages. Price 25s

A classified guide to the plastics industry in Australia, this latest edition of the year book serves as a complete index to the names and addresses of the country's firms, organizations, and specialists wholly or partially in the plastics field. Among those listed are custom molders, fabricators, finishers, manufacturers of machinery and equipment, and consultants. Chapters are also devoted to the chemicals and materials used by the plastics industry, trade names, manufactured products of the industry, and technical data.

"Rubber Red Book"

Published in 1951 by *Rubber Age*, 250 West 57 St., New York 19, N. Y. 1011 pages. Price $7.50

The 1951-52 edition of this biennial publication presents a complete directory of the rubber industry. Rubber manufacturers in the United States are listed alphabetically, by geographical location, and by the type of rubber product manufactured. Included also are complete listings of rubber machinery and equipment; laboratory equipment; accessories and fittings; rubber chemicals; fabrics and textiles; reclaimed rubber; synthetic rubbers; scrap rubber; and rubber latex. Additional features are the classifying of miscellaneous products and services, consulting technologists, trade organizations and journals, and a "who's who" in the rubber industry.

"Chemistry . . . Key to Better Living," edited by the staff of *Chemical and Engineering News* and *Industrial and Engineering Chemistry*.

Published in 1951 by American Chemical Society, 1155 Sixteenth St., N.W., Washington 6, D. C. 244 pages. Price $4.00

A history of chemistry in America during the past 75 years, this book depicts the interrelation between the growth of the American Chemical Society and the chemical industry during that period. Individual histories and reviews of development and industrial application are presented for each of the fields in which the chemical industry is subdivided. A special feature of the book is the illustrated story of the part the Society has played in the industrial chemical growth of the nation. Contemporary problems of science and civilization are discussed by well-known authorities.

"A Treatise on Milling and Milling Machines"

Published in 1951 by The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. 896 pages. Price $8.00

The theory and practice of metal cutting by the milling process, and related subjects such as toolroom milling setups and fixture designs, are thoroughly covered in this third edition of a valuable manual for engineers, machine operators, technical schools, and all those interested in the milling practice. Included among the 19 chapters are: the functions and operations of a variety of milling machines and milling attachments; cutting tools and technical data on metal cutting; a wide range of practical applications of toolroom milling and die sinking; principles of fixture design; practical examples of modern production methods; and the selection of milling machine equipment. There are over 200 formulas for solving various problems encountered in shop practice, and more than 700 illustrations and charts for an easier understanding.

"Directory of Packaging Machinery"

Published in 1951 by the Packaging Machinery Mfrs. Inst., 342 Madison Ave., New York 17, N. Y. Approx. 225 pages. Price $10.00

Designed as a ready reference for purchasing agents, factory superintendents, and others who might be interested in packaging machinery, this new directory lists the manufacturers of all types of such equipment. The directory is arranged in loose-leaf form so that up-to-date information may be conveniently added, and is divided into two sections. One section lists the kind of equipment desired and the names of the manufacturers making it. The other section, alphabetically arranged, gives names and addresses of the machinery makers and complete information on the machines each one makes.

Labeling plastics products—Illustrated with photographs and diagrams, this new 18-page booklet, "Technical and Merchandising Aspects of Labeling Plastics Products," describes the wide variety of labels currently available, methods for attaching them, and the general mechanics of labeling. The booklet devotes special attention to merchandising and label planning and cites case histories of several successful labels to point up the marketing and design considerations involved in reaching the single best labeling method for each of these products. Also included is a source list of labels and label equipment makers. *Monsanto Chemical Co., Plastic Div., Springfield 2, Mass.*

Adhesives—Listing and briefly describing adhesives, cements, lacquers, thinners, and retarders, this

folder serves as a handy guide to the company's line of products. A special feature of the folder is a table which serves as an index to adhesive problems and their solutions. *Slomons Labs,, 31-27 Thomson Ave., Long Island City 1, N. Y.*

Metal hoses and bellows—Especially prepared for the use of product designers, this 16-page catalog offers compete listings, descriptions, and specifications of the metallic bellows and the flexible metal hose and tubing manufactured by the company. A special feature is a guide to the proper usage of the bellows in various applications such as steam traps, instruments, valves, and many others. *Chicago Metal Hose Corp., 1315 S. Third Ave., Maywood, Ill.*

Methyl dichloroacetate—Complete information on the company's new product, methyl dichloroacetate, is offered in this technical data bulletin. Included is a listing of the product's properties and specifications, and data as to suggested applications. *Kay-Fries Chemicals, Inc., 180 Madison Ave., New York, N. Y.*

Operations manual—Available to railroad people and the shippers of any commodity, this 42-page manual serves as a guide to the proper loading and use of the company's freight cars. Features of the car are described in detail and one section of the manual, complete with diagrams and photographs, illustrates seven typical railroad car loads and their suggested arrangement for safe transportation. Enlarged blueprints on each of these types is available from the company. Other topics covered include: the cause of damaged shipments; operation of the damage free loading device; quick and safe loading; and proper methods for systematic unloading. *General American-Evans Co., 135 S. LaSalle St., Chicago 90, Ill.*

Applications of tracer control—Illustrated with more than 200 photographs, this 64-page book describes applications of tracer control for machine tools in the fields of metalworking, plastics, dies, and molds. More than 140 specific descriptions and production facts about jobs employing the company's tracer control are included. Also featured are illustrations of the company's tracer-controlled pantographs and duplicators, super-speed vertical milling machines, plain-type horizontals, universals, and automatic screw machines, as well as the wide variety of work samples and range of work piece sizes accommodated. The company's method for electrically etching hardened parts and the engineering service it maintains are special features of the book. *George Gorton Machine Co., 1100-13th St., Racine, Wis.*

Plastics exhibit—Press kit, issued by the company, contains photographs and information about its exhibit at The National Metal Exposition. The topics covered are: densified wood made with phenolic resins for aluminum forming dies; lightweight foundry patterns and core boxes, for casting metal in sand, made of low cost fillers and phenolic resins; use of styrene in precision investment castings; steel frame for use with foundry matchplates made of plywood surfaced with a sheet of cellulose fiber impregnated with phenolic resins; dies and drill jigs employing phenolic resins in their construction; and production of foundry molds and cores. *Bakelite Co., Div. of Union Carbide and Carbon Corp., 122 East 42 St., New York 17, N. Y.*

Silicone lubricants—A reprint discussing the properties, performance, and general usefulness of silicone lubricants as protective coatings is now available. Especially emphasized is the lubricants' resistance to heat and hence their desirability for greasing hot bearings and hot metal surfaces. Several tables and graphs are included to illustrate the effects of temperature, repeated shearing, and various bearing surfaces and loads on the physical properties of the silicone and organic greases. *Dow Corning Corp., Midland, Mich.*

Electric motor components—Intended for use by those who design, specify, and build electric motors, this company catalog gives information on the company's molded components for such units. For each of the various items covered, including brush holders, brush caps, commutators, and slip ring units. there is a complete stock size listing and dimension chart. One illustrated section details the progressive stages of production and installation of a molded shell commutator. The catalog is handily indexed for easy reference. *Midwest Molding and Mfg. Co., Triple "M" Electronents Div., 4630 W. Fullerton, Chicago 39, Ill.*

Dyes—Outlining the current methods for dyeing some of the newer synthetic fibers and blends, this 16-page brochure has just been published as an aid to overcoming the various dyeing problems brought about as a result of the mushrooming growth of the synthetic fiber field. The synthetics specifically covered are Dacron, Dynel, Acrilan, Orlon, Vicara, nylon, acetate and nylon blends, Celcos, saran, and Fortisan. *General Dyestuff Corp., 435 Hudson St., New York, N. Y.*

Shrink table sheets—Decimal equivalents for all dimensions from 1/64 to 12 in., compensated for material shrinkages from 1/32 in. per ft. to 1/2 in. per ft., are included in this comprehensive shrink table book. With each equivalent corrected to four decimal places, these tables provide engineers, die-makers, pattern-makers, and tool rooms with a precision method of checking or establishing measurements which involve known shrinks in ferrous and non-ferrous metal and plastic materials. Printed in clear, columnar form, these sheets eliminate the need for an extensive assortment of shrink rules and provide a high degree of accuracy. The book is available for $1.00 from *The Arrow Pattern and Engineering Co., Box 823, Erie, Pa.*

Metallizing handbook—Profusely illustrated with photographs, diagrams, and charts, this 250-page metallizing handbook provides comprehensive coverage of the technical as well as the practical aspects of the process. Various methods of surface preparation and the application of metallized coatings are outlined. Available for $3.00 from *Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y.*

Rotary files—This 12-page catalog lists the stock of rotary files; inside, outside, and tube deburring cutters; ball seat reamers; and threaded and taper shanks carried by the company. A special section offers tips on using rotary files, and a tabulation of

various operating speeds recommended for each. *DoALL Co., 254 North Laurel Ave., Des Plaines, Ill.*

Corrosion resistance—A method of protecting metallic surfaces from the corrosive action of many organic and inorganic chemicals by flame-spraying with polyethylene is explained in this 8-page illustrated booklet. The necessary equipment, surface preparation, application technique, safety precautions, and other requirements of the new method are fully discussed. Included also are laboratory test data indicating the effectiveness and limitations of polyethylene coatings. *Linde Air Products Co., Div. of Union Carbide and Carbon Corp., 30 East 42 St., New York 17, N. Y.*

Santicizer 8—Technical data sheets on the use of Santicizer 8, a mixture of N-ethyl ortho and para toluene sulfonamides, as a plasticizer for certain coatings, adhesives, and molding compounds are now available. In addition to chemical and physical properties of the plasticizer, the sheets contain a variety of starting formulas ranging from polyvinyl acetate adhesives for book binding to nitro-cellulose lacquers, cellulose acetate molding composition, and zein label varnishes. *Monsanto Chemical Co., 1700 South Second St., St. Louis 4, Mo.*

Process control—Designed for accurate control of process variables, such as temperature, pressure, flow, and liquid level, the company's Tel-O-Set controllers are fully described in this 4-page brochure. Included in the description is information on their dimensions, characteristics, advantages, and operation. *Minneapolis-Honeywell Regulator Co., Station 40, Wayne and Windrim Aves., Philadelphia 44, Pa.*

Wet blasting machine—A new machine for wet abrasive blasting is fully described in this 4-page bulletin. Intended for all cleaning applications in chemical and metal-working industries where close tolerances must be maintained or where the breakdown of sharp edges or corners must be avoided, the machine's various features are explained with photographs, engineering drawings, and cut-away views. Specifications and dimensions are

also presented. *American Wheelabrator and Equip. Corp., 555 South Bykrit St., Mishawaka, Ind.*

Vertical millers and profilers—This 12-page bulletin presents information on the company's vertical millers and profilers. Each of the three basic sizes are illustrated and described in detail, together with complete specifications for each. Also included are photographs of the various work applications to which the machines may be applied. *Pratt and Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn.*

Plasticizer catalog—Properties of Flexol brand plasticizers and their applications in plastics, coatings, and rubber compounds are described in a 76-page booklet. Twelve Flexol plasticizers are written up in detail; graphs and tables show their comparative properties, including volatility, extraction resistance, and low-temperature and electrical properties. Detailed sections describe the specific utility of the plasticizers in vinyl dispersions, nitrocellulose lacquers, natural and synthetic rubbers, and plasticizer emulsions. *Carbide and Carbon Chemicals Co., Div., Union Carbide and Carbon Corp., 30 East 42nd St., New York 17, N. Y.*

Tools in our economy—Suitable for wall mounting or for bulletin boards, this 4-color, 17 by 22 in. wall chart presents a graphic explanation of the economic factors affecting the progress of our standard of living. Employing data gathered from government and private industry sources, the chart depicts the relationship between natural resources, human energy, and man-made tools in creating the end product of man's material welfare. The chart is available for 25 cents from *The Wilkie Foundation, 254 North Laurel Ave., Des Plaines, Ill.*

Materials handling equipment—Designed for use by purchasing agents and those who might have a part in the selection or buying of materials handling equipment, this 8-page catalog offers a listing, complete with full specifications, of the various models manufactured by the company. The types covered are gas and electric fork-lifts, towing tractors, powered hand trucks, hand pallet trucks, hand platform trucks, and

hand stackers. A unique feature of the catalog is the handy visual cross-reference charts. *Clark Equipment Co., Industrial Truck Div., Battle Creek, Mich.*

Correct fire protection—Information on modern fire-fighting devices and the different fire extinguishing agents used in them is presented in this 32-page illustrated booklet. Differentiation between various types of fires and the correct equipment to be used in each case is a special feature of the booklet. Included also is a listing of the different sizes of units available. *American-LaFrance-Foamite Corp., 100 East LaFrance St., Elmira, N. Y.*

World trade data—A handy reference for those businesses with international dealings, this 32-page booklet offers such information as the rates and regulations covering international communications, conversion factors, trade fairs, uniform customs and practices for commercial documentary credits, electric voltages, and world-wide air services. The booklet is available for 50 cents from *Exporter's Digest and Int. Trade Review, 170 Broadway, New York 38, N. Y.*

Encyclopedia Errata

Our attention has just been called by The Visking Corp., Terre Haute, Ind., to errors on p. 383 of the Plastics Films Chart in the 1951 "Modern Plastics Encyclopedia and Engineer's Handbook." In the fourth column on that page, headed Polytrifluoro-mono-chloroethylene, Visking is listed as the manufacturer of Trithene film but the trade name is assigned to the Reynolds Metals Co. The trade name Trithene is the property of Visking and that company is the sole producer of it. Furthermore, Trithene is manufactured in thicknesses up to 0.010 inches. In the same chart, last column, Reynolds Metals Co. is again erroneously given credit for the vinyl-nitrile rubber film, Visten, which is, in actuality, manufactured by The Visking Corp.

INTERNATIONAL PLASTICS NEWS*

Activities Around the World of Interest and Importance to the Plastics Industry in the United States

Israel plastics plant—A wide variety of plastics products, both industrial and consumer items, will be manufactured in a plant to be established in Israel by the newly formed United States-Israel Plastics Corp.

The company will cooperate with the government of Israel in producing the plastics items most needed for the economic and material development of the country. The raw materials and machinery needed will be shipped to Israel, and as much of the work as possible will be done there.

Because of the tremendous housing shortage in that country, plastics materials which can be used in building will probably take a high priority. It is expected that Israel may prove a testing ground for certain plastics construction materials which are produced but are not in general use in the United States because of restrictive building laws.

The new company, which will be capitalized at one million dollars, has been incorporated under the laws of the State of New York. A. M. Katz, treasurer of Ideal Toy Corp. and board chairman of Ideal Plastics Corp., is president of the new company. Chairman of the board is Charles A. Breskin, publisher of MODERN PLASTICS.

Other officers of the company are: Alexander Konoff, president of Conmar Products Corp., Newark, N.J., manufacturer of doll accessories and slide fasteners, vice president; Jacob Brock, president of American Character Doll Co., New York, vice president; Emanuel Dee, Israeli industrialist, vice president; Benjamin Michtom, board chairman of Ideal Toy Corp., vice president; David Rosenstein, president of Ideal Toy Corp., secretary; and Philip Behrman, president of Alexander Doll Co., New York, treasurer.

Chairman of the executive committee is Wm. M. Lester, president of Pyro Plastics Corp., Union, N.J. Other executive committee members are: Larry Gering, president of Gering Products, Inc., Kenilworth, N.J.; Alexander Konoff, Charles A. Breskin, Philip Behrman, and David Rosenstein.

The various officers will pool the know-how of their companies to make the most advanced production techniques available to the plant to be established in Israel.

A substantial portion of the stock of the United States-Israel Plastics Corp. has already been subscribed, and American offices have been opened at 200 Fifth Ave., New York, N.Y. The company hopes to commence operations by May, 1952.

British melamine factory—In these columns in our July 1951 issue the erection of a new melamine plant by The British Oxygen Co., Ltd. was reported. It has now been called to our attention that this plant is making melamine only, and not melamine resins as reported.

It should further be noted that the technical bulletins announced in the same report not only outline the properties of melamine but also describe the preparation of resins suitable for application in certain fields. Address of The British Oxygen Co. is Bridgewater House, Cleveland Row, St. James's, London, S.W. 1.

British exhibition planned—As a result of the success of the first British Plastics Exhibition and Convention at Olympia, London, in June 1951, a similar event is being planned for June 1953. The exhibition and convention is being organized with the full support and cooperation of the British Plastics Federation by *British Plastics,* Dorset House, Stamford Street, London, S.E.1.

Cellulose film plant—Transparent regenerated cellulose film and other packaging materials will be manufactured at Cornwall, Ontario, Canada, by a newly formed company, T.C.F. of Canada, Ltd. The new company, which will be the second manufacturer of transparent cellulose film in Canada, is closely associated with British Cellophane, Ltd., England. Major shareholders in T.C.F., along with British Cellophane, will be Courtaulds Ltd., manufacturers of rayon, and Courtaulds (Canada) Ltd. The new company is now constructing a plant, which will be in production by spring of 1953, with an initial annual output of about seven million pounds. The sales offices of T.C.F. of Canada will be in Montreal.

Polyethylene in France—As a result of the growing demand for polyethylene in France, a company has been set up in Douai to produce the material under license from Imperial Chemical Industries, Ltd. The new company, Ethyleneplastique, will soon start to construct a factory in Mazingarbe with an initial output capacity of 2000 tons per year. Production is expected to begin in the latter part of 1953.

Polystyrene output—The production of polystyrene in the United Kingdom has been further increased by the completion of a new plant by O. & M. Kleemann, Ltd. Styrene monomer production will soon be increased by the completion of the Forth Chemicals, Ltd., plant at Grangemouth. Production is expected to begin this year.

Phenolic dashboard—The dashboard for the Simca Aronde automobile is being molded of phenolic by Richard Haas et Cie., Paris, France. The piece weighs almost 5 kg. and is 1.20 m. long. It is produced at the rate of 200 a day on a 1400-ton press. The same company is also molding the inside window frames for each of the four doors of the same car.

More Polystyrene in Brazil—Bakol Co., near Sao Paulo, Brazil, reports that it has more than doubled production of polystyrene within the past seven months and asserts that it now has sufficient capacity to supply the entire Brazilian market. At present the company is also exporting polystyrene to European and other South American countries.

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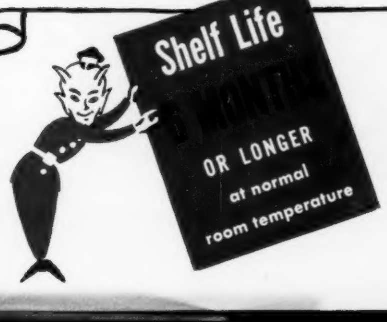

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Cellulosics

(*Continued from pp. 77-8*)

cut. So far, the military take has been small—it wasn't overwhelming in World War II except for film. But many things could happen. Inhibiter strips, for example, could be produced from acetate if they were to be used immediately—only in storage are they undesirable because acetate absorbs nitroglycerin after several months lay-away.

Other great quantities of molded or extruded acetate would undoubtedly be required in the missile program, but no details are available. In an all-out war, flake might even have to be diverted from rayon to acetate for military uses.

Ethyl Cellulose

The miscellaneous materials listed in Table B consist almost entirely of ethyl cellulose and Valite—the latter a thermoplastic material derived from bagasse which is used primarily for phonograph records, sales of which declined rapidly in 1951, starting in late spring. Ethyl cellulose has been peculiarly affected all year. Until recently, government officials have been talking about putting it on allocation because of military need. The DO orders were heavy at one time, but now it seems that the military people aren't sure what they want to do about it and talk of allocation has been silenced. The proximity fuse and inhibiter strips used large quantities in 1944 and 1945. Probably some prospective uses are similar; then, there are things like army flashlight cases and field telephone housings which could demand ethyl cellulose.

DO order business took so much of this material early in the year that the producers' attempts to promote developmental items for the civilian trade were set back severely. When military buying eased off about September, there were few new applications ready to use up available material. Supply is limited—probably less than one million lb. a month of molding material—so the business of catering to military whims that might suddenly "whim-up" a demand for more than is available and of simultaneously promoting civilian uses is complex and nerve wracking. The forecast now is plenty of ethyl cellulose for civilian use in 1952.—END

Phenolics

(Continued from pp. 78-80)

for laminates was about the same in both 1950 and 1951. The high month was March 1951, with 8 million lb.; in the last six months the figure dropped to around 5 million lb. a month.

No figures are available as to the amount of finished laminate produced in this period. It is difficult to find two people who will agree as to the amount of finished laminate that 76 million lb. (see Table C, p. 79) of solid resin will produce.

In addition to phenolic laminates, somewhere near 25 million lb. of melamine laminates were produced in 1951, according to one laminator.

The last half year's decline was caused by a drop in decorative laminate and in industrial laminates for television and radio, the latter's decline having started early in 1951.

Decorative laminates were possibly held back by a decline in the furniture industry but the picture was also disturbed by shortages of aluminum and chrome plate for dinette furniture. Furthermore, it is generally admitted that production was so high in late 1950 and 1951 that consumers were unable to absorb it.

Laminates for the Military

There is no decorative laminate among military requirements at the moment, but industrial laminates for the military are running—or were until a month or so ago when they dropped off—at from 15 to 30%, according to most laminators, as contrasted to less than 5% pre-Korea. But dollar volume for military industrial laminates is high—perhaps 70% of total business. In general, laminators feel that military orders will increase in 1952, will reach a peak of perhaps 50 to 60% of production in the second quarter, and will remain at that peak for some time to come. It is possible that most military laminates will require a fabric base as they did in World War II, but so far there has been no great military trend away from paper. It may be that a great many purely mechanical aircraft parts machined from fabric base laminate during World War II should have been molded and since then, standardization of such parts into molded pieces

has taken place. This situation applies largely, of course, to such things as cable blocks, clamps, and secondary structural parts that are not stressed members.

The industrial laminating industry for civilian use is limited by the output of manufactured products using laminates and has now reached a point where further expansion may depend on new developments and new ideas. It has increased on a dollar volume by 2½ times since pre-World War II, and that increase has been based largely on greater volume production of its customers. To continue its growth, most laminators feel new products will have to be forthcoming.

Most of the new laminates are high cost products on which applications will be limited. Silicone laminate, for example, at $8 per lb., will be used only where its properties are essential, but more of it was marketed per month in early 1951 than in the whole of 1950. It is possible that high temperature phenolic materials in process of development and new alkyd laminates having high temperature resistance, will eventually take over part of this field because of lower cost.

Among other new trends is the development of unwoven fabric base laminates, other fabric bases which give improved electrical properties, nylon fabric laminates, and copper surfaced laminates for printed circuits. This latter should grow much larger as the electronics field continues to expand for both military and civilian industries.

Phenolic laminated wood is also back in the picture again after a few years of relative inactivity. The business really began during World War II with aircraft propellers. At least five times more is now being produced than during that war and today cutlery handles are the biggest application. In fact, wood laminates have taken over 20% of the cutlery business and it is expected that they will expand to 60 to 75% in the near future. But, unfortunately, the cutlery business is presently slow because of metal.

An interesting test is being made of phenolic laminated wood for industrial flooring. Whether or not it will justify the extra cost is not yet known, but so far, it has been standing up to punishment better than concrete.—END


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The Northrop F-89 Twin Jet Interceptor
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The U. S. Air Force's Northrop Scorpion all-weather, night-and-day interceptor, with its sextet of 20 mm. cannon in the nose section and 16 five-in. high velocity rockets under its wings can give a terrific account of itself in actual combat.
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Urea, Melamine

(Continued from pp. 81-3)

good until July but slumped severely after that. Larger molded pieces made from urea, like other plastics, are also in the offing. Urea toilet seats, for example, are arousing much interest after the years of mild production activity. In England, Canada, and Australia they were generally accepted several years ago.

Color Appeal

A bright spot in late 1951, which will probably carry over into 1952, is a tendency for the market to again turn to urea for its greatest sales appeal—color. There is said to be a noticeable switch from black to colored closures and wiring devices. In home furnishings and radio cabinets a similar trend is claimed, especially where finishes sprayed over other materials have been used in the past. Molders have been able to take advantage of this trend because of the speed-up in molding time with fast-curing ureas; the gap in cost between urea and phenolics has been narrowed to a considerable degree.

Still another optimistic viewpoint is that low cost black or brown urea to sell at a price as low or lower than most any other plastic now seems definitely assured. Such material is particularly practical for electrical applications since it does not arc; it should be adaptable as well for closures, buttons, etc.

The entire pricing picture in both melamine and urea is worth consideration by any student of future plastics progress. Melamine price, because of increasing production, is almost certainly destined to drop to a level more competitive with lower cost plastics though the producer has made no promises. It is perhaps significant that melamine's price has not increased in the last 10 years.

Urea plastic, a material produced from two low cost chemicals, may well come down in price when certain production problems have been licked. For example, glue made from these materials is only 15½¢ a lb. today and might possibly be a forerunner of lower costs in other urea formulations at some future time when world economics and politics allow more time for concentration on technical problems.—END

Vinyls

(Continued from pp. 83-5)

business; there was some, but not in overwhelming quantities, and what there was went to a surprisingly small number of spread coaters. Vinyl coated wall covering looks like a big possibility for future expansion. Plastisols took over a good portion of the coated fabric and paper field. About 35 million lb. of plastisol were produced in 1951—5 million more than 1950. About 75% went for fabric coating. Dip coating, slush molding, and all sorts of miscellaneous uses took the rest.

Vinyl extrusion and molding material moved ahead of film in volume consumed for the first time since the war. Wire coating was the chief reason; heavy DO order business was the impelling force behind demand. Some 35 or 40 million lb. was used for this purpose. About 100 million ft. of vinyl garden hose was extruded in 1951 in comparison to about 80 million in 1950, averaging about 6 lb. of resin per 50 ft. of hose. Only one or two major companies are now producing braided hose with a vinyl jacket—it's a low profit item because of a low selling price forced by a competitive market. Extruded welting, especially for automobiles, is steadily gaining ground. Ford reportedly used twice as much in 1951 as 1950 on inside of car bodies and may make a similar increase in 1952 by including vinyl welting around windows and floor mats. Chrysler is also stepping up similar uses.

In molding material, the big item is phonograph records despite a severe drop after last spring. Slush and dip molding grew fast in 1951 —may have used 8 to 10 million pounds. Elastomeric molding still grows slowly but optimists are confident it has been held up largely because of lack of time to work on techniques and markets. A new colored refrigerator gasket to replace rubber gave great promise in 1951.

Still significant is the brief notice given to readers of this magazine in November 1943 when almost every pound of vinyl available was taken by the military, and only wire coaters, beer can coaters, and a very few calenderers had had much of a look at it. The notice read: "Keep your eyes on the vinyls!"—END

Expansion

(Continued from pp. 93-4)

approval and assistance of the government, to expand production capacity for both Plexiglas sheet and molding powder sufficiently so that military requirements are not interfering with civilian supply. The acrylic program has involved expansion of production facilities in all steps of the manufacturing process from raw materials through finished sheets and molding powder. This includes all plants concerned with acrylic production: Bristol, Pa.; Knoxville, Tenn.; and Houston, Texas. The expansion program is still under way and will be continued in order to keep step with the military program.

The company has adequate capacity for the manufacture of polyester resins to meet any foreseeable military and civilian requirements, so that no expansions are contemplated in the near future.

Shell Chemical Co.—The company does not anticipate any resin expansion which can take effect in 1952. They do expect to increase production facilities for Epon resins, but these will not materialize until early 1953, and the availability of the Epon resins will be limited until that time.

Shell Chemical and Diamond Alkali Co. are pooling their resources to manufacture and market vinyl chloride monomer. Shell will supply ethylene from petroleum; Diamond Alkali, chlorine from ordinary salt. The material is not expected to become available until 1953.

United States Rubber Co.—The Baton Rouge, La., Paracril synthetic rubber plant is now being expanded to double its capacity. The expansion program will bring plant capacity for the production of Paracril nitrile rubber, Nitrex latex, high styrene latex, and high styrene resins to approximately 30 million lb. annually. This expansion is expected to be completed by July 1952.

Plans have been approved for the expansion of the Painesville, Ohio, polyvinyl chloride plant from 25 to 50 million pounds. However, this expansion depends upon the approval of the NPA before work can actively start. Approval is hoped for during the first quarter of 1952.—END

High production schedules have no place for slow-downs because of difficulty encountered in obtaining intricate parts *in a hurry.* That's why more and more manufacturers are turning to modern molded plastics as a solution to their production speed-up problems.

Today, literally scores of new plastic materials afford an endless choice of physical, chemical and other special properties. Yet, this very fact makes doubly difficult the task of selecting the *one* best material. That's where General Industries' customer service begins.

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FABRICATED POLYETHYLENE CONTAINERS. Collection of data sheets illustrates and describes bottles, jars, jugs, funnels, piping, rods, sheets, fittings, and valves made of Agilene polyethylene. Includes data on hot gas welding guns. American Agile Corp. **(A-201)**

HANDLING WEBS AND MONOFILAMENTS. Some primary considerations with respect to handling of continuous strand or web materials. Data on extrusion take-up, plastic tubing, and textiles coated with plastic. Industrial Ovens, Inc. **(A-202)**

INJECTION MOLDING MACHINE. Data and specification sheet describes an automatic-feed injection molding machine which handles shots up to one-half ounce. R. H. Windsor, Ltd. **(A-203)**

MULTIPLE UNIT TUMBLING BARRELS. Bulletin illustrates multiple horizontal and vertical tumbling barrels for deburring, cutting down, and finishing of plastic parts. Recommends compounds for specific applications. Tumb-L-Matic, Inc. **(A-204)**

WORK FEED TABLE. Booklet containing installation photographs and detailed descriptions of the Bellows rotary feed table for feeding work to automatic machines. The Bellows Co. **(A-205)**

VINYLITE RESINS AND PLASTICS. Booklet describes Vinylite vinyl chloride-type materials for extrusion and molding. Includes suggestions for formulating, properties, and tabulated technical data. Bakelite Co., Div. Union Carbide and Carbon Corp. **(A-206)**

REVERSE ROLL COATER. Bulletin describes the "Contracoater," a reverse roll coater designed to apply plastisols, organosols, resins, and lacquers to paper, foil, film, or fabric. Dilts Machine Works, Div. of The Black-Clawson Co. **(A-207)**

BANBURY DISPERSIONS OF HIGH-STYRENE COPOLYMER RESINS WITH RUBBER. Report of a study investigating the factors that influence the ease of incorporation of high-styrene copolymer resins in rubber compounding. The Goodyear Tire & Rubber Co., Inc. **(A-208)**

RECORD PRESSES. Folder describes Baldwin conventional four-column record presses and tilting head record presses. Contains specifications and advantages. The Baldwin Locomotive Works. **(A-209)**

"AMBERLITE" MONOBED DEIONIZATION. Discussion of latest methods for removal or reduction of the mineral solids content of water and other process liquids by use of "Amberlite" Monobed Deionization. Describes techniques, purity of end products, etc. Rohm & Haas Co. **(A-210)**

LABORATORY MIXER. Leaflet describes a small, powerful laboratory mixer with counter-rotating action for resin dispersion and other mixing needs. Brookfield Engineering Laboratories, Inc. **(A-211)**

MOLDING OF PLASTICS. A pictorial presentation of the facilities available at General Industries for engineering, mold making, compression, transfer and injection molding, and finishing of custom-molded plastics. The General Industries Co. **(A-212)**

"SPIRAL FLOW" MIXERS. Specifications, features, and details of several sizes of intensive mixers of unique design which allows cooling or heating of the product being mixed. Stewart Bolling & Co. Inc. **(A-213)**

"SOLKA-FLOC" FOR RUBBER. Bulletin tells how "Solka-Floc" finely divided wood cellulose fibres can be used as a filler material for rubber. Charts show typical effects on properties. Brown Co. **(A-214)**

ELECTRONIC SEALING AND HEATING. "Thermatron" sealers for rainwear and other film products, and heaters for heating preforms and other applications are described in this bulletin. Radio Receptor Co., Inc. **(A-215)**

EXPANDER. Described is the "Free-Wheeling" expander for producing maximum width and eliminating wrinkles from coated fabrics and plastic films. Method of use, specifications, and prices are included. Mount Hope Machinery Co. **(A-216)**

VERTICAL MILLERS AND PROFILERS. Brochure contains illustrations and specifications of three models of Pratt and Whitney vertical millers and profilers which can be used in mold and die making. Pratt & Whitney, Div. of Niles-Bement-Pond Co. **(A-217)**

MOLDING FACILITIES. Folder illustrates typical products and the facilities for manufacturing by injection and compression molding available at the Vlchek Tool Co. **(A-218)**

PLASTICS DOLLAR'S WORTH. Illustrated bulletin describes eleven G.E. advantages that may help save money on plastics jobs. General Electric Co. **(A-219)**

AIR CYLINDERS. Booklet contains engineering data, mounting drawings, and specifications for various models of Miller high efficiency air cylinders. Miller Motor Co. **(A-220)**

DURITE. Brochure describes the various types of Durite phenolic and urea products now available, as well as the industries in which new and modified Durite products might be utilized. Chemical Div., The Borden Co. **(A-221)**

PRINTING MACHINES. Catalog describes various hand operated, semi-automatic, and automatic machines for printing, decorating, etching, gold stamping, roller coating, and dipping plastic items of all sizes. Apex Machine Manufacturing Corp. **(A-222)**

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PRE-DIP FOR ELECTROPLATING. Folder gives description from chemical point of view of "Stannochlor" anhydrous stannous chloride which can be used as an effective pre-dip for electroplating of plastics. Metal & Thermit Corp. **(A-223)**

TOOL STEEL SELECTOR. Circular chart which quickly tells exactly what type of tool steel should be used for about 95% of the machine-tool operations found in jobbing and specialty machine shops. Instructions for use included. Crucible Steel Co. of America. **(A-224)**

TUBING AND FITTINGS. Descriptions and complete specifications of various sizes of saran tubing and fittings. Includes technical data and physical and mechanical properties. Elmer E. Mills Corp. **(A-225)**

GLASS REINFORCEMENTS. Booklet tells about facilities for manufacturing glass fibre reinforcement for plastics and explains the various forms in which they are available. Libbey-Owens-Ford Glass Co. **(A-226)**

ETHOXYLINE RESINS AS ADHESIVES. Booklet describes Araldite type I (powder) and type XV (liquid) thermosetting adhesives used for bonding metals to metals, ceramics to metals, and for other difficult bonding assignments. Ciba Co., Inc. **(A-227)**

INJECTION MOLDING MACHINES AND MOLDS. Detailed specifications on PECO 2-, 4-, 6-, 8-, and 16-oz. injection molding machines and the mold building facilities of The Projectile & Engineering Co. Ltd. **(A-228)**

LACQUER FOR STYRENE. Question and answer leaflet on New England gloss lacquers for finishing styrene. New England Lacquer Co. **(A-229)**

DRYING PLASTIC LAMINATES. Application report shows how "Chromalox" electric radiant heaters are used to dry and partially cure varnish-impregnated cloth in carefully controlled steps. Edwin L. Wiegand Co. **(A-230)**

STEELS FOR PLASTIC MOLDING. Booklet *Tooling Up For Plastics* is a practical guide to the selection, application and heat treatment of Carpenter steels. Contains tips on plastic tooling, selection of mold steels, and data on tool steels for hobs. The Carpenter Steel Co. **(A-231)**

ELECTRIC POWER DRIVES. Pictorial presentation of 70 applications of Sterling electric power drives from a wide cross-section of industry. Sterling Electric Motors, Inc. **(A-232)**

VERTICAL INJECTION MOLDING MACHINE. Bulletin contains specification and description of a 1-oz. vertical injection unit suitable for laboratory requirements and short production runs. Watson-Stillman Co. **(A-233)**

CARBON BLACK DISPERSIONS. A summary of technical data and operating suggestions covering "dag" concentrated carbon black dispersions for coloring thermoplastic resins is contained in this folder. Acheson Colloids Corp. **(A-234)**

"SANTICIZER 8." Bulletins list formulas and typical properties which may be obtained by using "Santicizer 8" as a plasticizer for cellulose acetate, nylon and related polyamids, nitrocellulose, and polyvinyl acetate. Monsanto Chemical Co. **(A-235)**

PLASTICS FINISHING. Description of a method and machine for removing fins and flash from molded parts with special non-abrading particles. American Wheelabrator & Equipment Corp. **(A-236)**

NYLON PLASTIC BALLS. Bulletin lists the various standard sizes in which Ace nylon balls are available for use in valves, anti-friction bearings, and other industrial applications. Describes mechanical, thermal, and chemical properties of the nylon material. Ace Plastic Co. **(A-237)**

MOLD TEMPERATURE CONTROL. Booklet describes the workings and advantages of the "Thermolator" for maintaining precise temperatures in molds and cores. Industrial Mfg. Corp. **(A-238)**

"FORMICA" FOR INDUSTRIAL APPLICATIONS. Booklet explains various electrical, chemical, and mechanical applications of Formica laminated plastics. Explains how grades are engineered to meet specific requirements. The Formica Co. **(A-239)**

XALOY AND XALOY 306. Booklet describes the corrosion and abrasion resistance of two special metal surfacing alloys which have particular application in extruding machines. Industrial Research Laboratories, Ltd. **(A-240)**

"LUCOFLEX" RIGID POLYVINYL CHLORIDE. Booklet explains how the superior mechanical, electrical and chemically resistant characteristics of "Lucoflex" rigid vinyl suit it to a wide range of industrial applications. Data on fabrication. American Lucoflex, Inc. **(A-241)**

SLITTER AND WINDER. General description, specifications, illustrations, and the outstanding features of the Jacques slitter and winder are given. Hobbs Mfg. Co. **(A-242)**

STOCK ITEMS. Caps, radio housing, electrical parts, and hundreds of other pieces are shown, with descriptions and specifications. Loose-leaf catalog. Waterbury Companies, Inc. **(A-243)**

PEARL ESSENCE SUBSTITUTE. Nacromer, a material used extensively as an undercoat in the manufacture of simulated pearls, is discussed. Also presented are its many other uses. Mearl Corp. **(A-244)**

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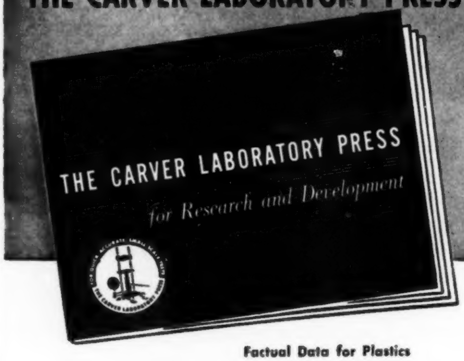
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Molds

(*Continued from p. 98*)

others believed that accelerated training programs would help.

Because of the labor factor and the general production tempo, many tool shops have found it necessary to up their delivery dates. A job ordinarily quoted at ten weeks now frequently takes twelve; a similar jump has been necessary for more complex, close tolerance work. But delivery dates seem to be stabilizing at these levels, and as production problems are unknotted and efficiency climbs, the delivery curve may show a drop.

That, briefly, is the way the mold making picture stacks up today. Responsible tool industry leadership right in the thick of it is carefully exploring every possibility to hike overall production efficiency. But they'll need help. And that's where the plastics industry comes in. Molders can do much to lighten the burden.

Six-Point Program

Here is a suggested six-point program for all plastics molders and end users, designed to bring about better utilization of existing tool facilities:

1) *Know your mold maker's facilities and limitations.* He has a big share in the plastics business, too. Any problem that affects him, affects you directly or indirectly. Those molders who have developed a working partnership with their mold makers are currently enjoying a position of preference. This sort of close association pays off in dollars and cents in the tight spots.

2) *Give your mold maker enough time to do the job right.* Plan your own production schedule so as to allow your mold maker the time he needs to do a good job for you. In some cases, rush jobs may be justified; in the great majority of instances, with proper planning and early ordering, the job can be done without stampeding the mold maker. Such common sense procedure lets your mold resource make the best use of his labor and equipment and will win good will for you.

3) *Consider a good mold a good capital investment.* This sounds like an elementary suggestion but, surprisingly enough, there are still a few mold buyers who think they can get quality molds at bargain basement prices. This just isn't possible. Mold making is a highly skilled craft involving an extensive background knowledge and experience. For that reason there can be no "cheap" mold. Tool men themselves, acutely aware of former cut-rate price shopping, are the first to point out the heartening fact that molders are increasingly putting the emphasis on quality and placing price secondary.

4) *Re-examine your plans before you decide to retool.* Are you planning a new mold which calls for only minor design changes? Will these design changes mean only a slight sales advantage? It might be good business to hold up at this juncture and wait until you can really let go with a bolt of thunder. At the same time you'd be doing the tool industry a real favor by not tying up toolmaking equipment needed for more essential jobs.

5) *Help utilize a greater share of the country's mold making facilities.* If you find that your regular mold maker is unable to take on your job, investigate other sources of supply. In so doing you'll help in the more efficient scheduling of tool facilities.

6) *Save money: Think the job through.* A lot of grief (time and dollar-wise) can be avoided by knuckling down and taking a really good look at all aspects of the job. Shape it up on paper; use the model maker; project it in the conference room. Catch the mistakes and changes in the blueprint, not in the metal.

Strengthen the cooperation between molders and mold makers. This will help solve many of the immediate problems at hand and will account for increased and more efficient production in the future.

Survey Method

As the caption over the map on p. 98 indicates, the survey on which the facts presented above are based was conducted by mail. The questionnaire which molders were requested to answer involved a series of eleven questions. In compiling the figures given on the map, no attempt was made to weight them as to size of shops; the figures simply represent the number that were or were not in a position to take on new work at the time.—END

Electroforming

(Continued from pp. 107-8)

plastic or other non-conductive material may be employed. And because the strength of electroformed copper or nickel is generally not sufficient to withstand injection pressures, electro-formed cavities must be backed up by steel.

Electroformed molds for low pressure molding are produced in approximately the same manner, with the exception that the matrix is generally produced in plaster, especially if the mold is to be for a comparatively large piece. If the mold is to be for a smaller piece, acrylic stock can be used for the matrix. In any case, the sensitizing and plating operations proceed in the same manner as for the production of spray masks.

An interesting development in the design of slush molds for the production of doll heads has recently been perfected by the Margon Corp., Bayonne, N.J., in cooperation with A. Buschow, chief engineer, Bart Laboratories, Belleville, N.J. This development makes possible the use of moving eyes in the flexible-type heads produced by slush molding plastisols. Up until the development of this new eye it has been impossible to incorporate moving eyes in such heads because of the interference of the eye counterweight with the head stuffing.

This new method makes use of two separate enclosed moving eye units which contain the components. The problem was to find a method of mounting these eye units so they would be held firmly in position. The solution was to mold enclosed pockets inside the head, into which the eye-ball assembly is introduced through the eye opening. The flexibility of the plastisol makes the assembly simple and at the same time grips the eye unit tightly so that it cannot move out of position.

Another interesting use for electroformed molds is in the production of formed plates for pressing or post-forming acrylic sheet stock. One such application used for making the magnifying lenses in television enlarging screens is made from thin sheet of acrylic by forming on one of its surfaces many small concentric lenses.—END

(MODERN PLASTICS, March 1951, p. 81)

Embedment

(Continued from pp. 113-14)

such as anhydrous calcium chloride, at room temperature so that all peracetic acid is removed and none will be present to catalyze the polymerization of the resin.)

"Solution No. 6 is generally used for bleaching flowers such as gardenias, orange blossoms, magnolias, and stephanotis. Some flowers may not respond in this solution, particularly the hybrid white roses and white camellias. Solutions Nos. 7 and 8 are suitable for many whites, and no further treatment is required. Certain white roses turn a beautiful yellow in solution No. 6, even to bruised portions that have previously turned brown. When it is desired to bleach a colored flower, such as an orchid, the fresh flower should be placed in solution No. 6 without previous treatment."

Large flowers like orchids sometimes require support while in the solution. Such supports may be thin aluminum strips riveted together at one end so that each strip can be pivoted around the rivet and then bent to the desired shape.

Care must be taken in removing flowers from the solutions as they tend to become brittle. After removal, the flowers are quickly drained, and then immediately placed in a drying oven maintained at 45 to 60° C. (113 to 140° F.). One to two hours drying time is considered sufficient. After drying, the flowers are removed to storage boxes containing a desiccant, where they remain for at least 24 hours.

Tests made at the University of the many resins available finally resulted in the selection of Selectron 5026, made by Pittsburgh Plate Glass Co., which was found "to be the most practicable from the standpoint of handling, workability, and suitability."

The catalyst which was most successfully used in the University experiments is tertiary butyl hydroperoxide.

Here are the University's instructions as to the amount of the catalyst to be used: "For castings which are less than ½ in. thick, as much as 0.45% tertiary butyl hydroperoxide, i.e., 5.0 ml. per 1000 g. of resin, may be used. For sections 1 in. thick, successful results have been obtained when using 40 drops (1.0 ml.) of the catalyst per 1000 g. of resin. For sections which are thicker than 1 in., 20 or 30 drops of catalyst are added per 1000 g. of resin."

As soon as all air bubbles have risen to the surface, the catalyzed resin is ready to be poured from the mixing vessel into the molds. The University experimenters prefer glass for molds because of its transparency; they recommend a thin film of kerosene for a mold lubricant.

One of the most ticklish parts of the operation is placing the preserved flowers in the liquid resin. Flowers may be removed from storage and placed in the mold either before or after the resin has been poured, but should be kept out of humid atmosphere since they will rapidly absorb moisture and lose their shape.

When a large number of small pieces are to be made, a recommended procedure is to pour a layer of catalyzed resin into the prepared mold to a depth of about 60% of the finished embedment. The preserved floral specimens are dropped, one by one, on this bottom layer of liquid resin, face down. They are then turned face up, using a bent wire or a two-pronged fork to turn each flower slowly on edge, after which it is allowed to tip over by its own weight.

After the flowers are turned over, they tend to drift toward the edges of the container and must be held in place laterally.

Only enough resin is needed for the top layer to cover the flowers and allow for facing.

After being allowed to set for about 15 hr. in a constant-temperature water bath, the casting is ready for the oven, which is at room temperature when the casting is placed in it and then slowly heated to 65° C. (149° F.). For small castings, a temperature increase of 20° C. per hr. is considered to be quite safe. The oven is allowed to cool to room temperature before the castings are removed.

The castings are now ready for the finishing operations, such as sawing into blocks with a bandsaw; forming into circular shape with a lathe; squaring up the vertical faces and edges with a sander; and polishing on a buffing wheel.—END

(MODERN PLASTICS, October 1951, p.113)

Circuits

(*Continued from pp.* 114-15)

ponents can be unsoldered and resoldered several times before foil tends to lift from base.

Dip soldering shows great promise as an assembly technique for smaller units. All of the circuitry is placed on one side of the plastic piece. Holes about 0.040 to 0.045 in. in diameter are punched or drilled to take the leads of resistors, capacitors, subminiature tubes, etc. All of the components are placed in position on the opposite side of the piece from the etched pattern, with their tinned leads inserted through the holes. Usually the conductors are fluxed prior to this operation with a non-corrosive rosin-type flux. All the necessary connections are then made between the components and the conductors by a single short dip in a molten solder bath. After dipping, excess lengths of the protruding leads are trimmed off.

For insurance against bridging of the solder from one conductor to another, a spacing of at least 0.030 in. should be left between conductors. If any portions of the printed circuit, such as an inductance coil, are to be left free from solder, they must be coated with a lacquer or masked in some other way before dip soldering.

Another approach to dip soldering may be used for chassis larger than about 6 by 6 in., where warpage becomes a problem when one side of the plastic itself is dipped into the solder bath, or where circuitry on two sides is needed. Tinned hollow pins similar to the pins in a standard large octyl base tube are riveted into place in the tinned circuit pattern at every point where a component lead must be connected or where a connection must be made between conductors on opposite sides. The components are placed on the side opposite to the side from which the pins protrude, and their leads are inserted into the pins. All connections are made at once by dipping the pins into a molten solder bath.

After units have been assembled it is advisable to coat them with a moisture- and fungus-resistant lacquer or varnish either by spray or by dipping. Potting the completed circuit is another procedure often followed.—END

(MODERN PLASTICS, August 1951, p. 99)

Dry Coloring

(*Continued from pp.* 115-18)

range from yellow to red can be prepared from single cadmium colorants. To produce exact matches, suitable toners can be added.

A number of companies[1] supply color formulations to match any color required. The colorants are already mixed, and in some instances receive special treatment to provide improved coloring and moldability. Also, some of the colorant processors offer the colorants weighed out in packages sufficient to color 100 lb. of crystals.

The colorant processors supply the colorants in a form which in a number of instances produces improved color dispersion, especially for those colorants composed of a number of ingredients. Another advantage in purchasing colorants from processors lies in reduced moisture susceptibility. Colorants purchased from some of the processors usually are treated to minimize moisture pickup and eliminate subsequent molding difficulty.

In order to get the best results from dry coloring, strong emphasis should be placed on proper die construction and the use of mixing disks or nozzles.

A recent development in the injection molding field which ties in with dry coloring is that of pre-plasticization. When dry colored materials are molded in machines employing the pre-plasticizer principle, completely satisfactory coloring results are obtained.

In addition to producing the usual transparent, translucent, and opaque colors, there are a number of special effects which can be obtained through dry coloring.

Mottles—Vivid opaque mottles can be produced by dry blending the major component and adding the minor component in pelletized or granular form. Certain mottles with one transparent and one opaque component can be obtained by dry coloring both. In actual use, the two components are either blended together or poured into the injection machine hopper simultaneously and molded directly. Large nozzles should be used. Large gates and runners are also recommended for the most pronounced mottles.

The use of pre-plasticizers for the molding of mottles is not recommended; the milling or mixing action tends to disperse and smear the mottle so that, at best, a streaky color or, at worst, a complete blend of all the colorants will result.

Fluorescents—Another field where dry coloring shows to good advantage is in the manufacture of fluorescent colors. Basic color manufacturers[2] supply fluorescent colorants to meet a broad range of requirements. Some colorant processors also supply fluorescents.

Phosphorescents—In the field of phosphorescent colors, it has definitely been established that dry coloring produces a product superior to processed colored materials.

A series of phosphorescent colorants which are suitable for dry blending is being marketed.[3]

Processed phosphorescent colored molding material has heretofore carried a premium of approximately 35¢ per lb. over the standard crystal price. By dry coloring colored items can be produced at a cost of only 5 to 20¢ per lb. over the crystal price, thus saving 15 to 30¢ per lb.

Tinsel—Another novel effect which can easily be produced through dry coloring is that of silverflake or tinsel. The use of imported silver metallics No. 5[4] in a concentration of 10 to 15 g. per lb. of colorant blend, or aluminum flake No. MD-1100[5] in a concentration of 0.5 to 5.0 g. per lb. of colorant blend can be used.

It should be noted that in the molding of dry blended tinsel colors, the use of small nozzles, disks, or pin point gates should be avoided, since the tinsel components are usually of sufficient size to plug small orifices. Conventional gates and nozzles should be used.

Colored metallics, increasing in popularity, are economically obtainable by the flexibility of the dry coloring method.—END

(MODERN PLASTICS, February 1951, p. 79)

[1] Molders may contact the following colorant processors for suitable color formulations: Ferro Enamel Corp., 4150 E. 56th St., Cleveland 5, Ohio; Krieger Color & Chemical Co., Inc., 6531 Santa Monica Blvd., Hollywood 38, Calif.; Gering Products, Inc., N. 7th & Monroe Ave., Kenilworth, N. J.; H. Kohnstamm & Co., Inc., 89 Park Place, New York 7, N.Y.; Claremont Pigment Disperson Co., Inc., 110 Wallabout St., Brooklyn 11, N.Y.; Midamerica Plastics, Color Div., 2443 Prospect Avenue, Cleveland, Ohio.

[2] Such as Calco Chemical Div., American Cyanamid Co., Bound Brook, N.J.; Wilmont & Cassidy Co., 108-112 Provost St., Brooklyn, N.Y.; and General Dyestuff Corp., Leroy & Hudson Sts., New York, N.Y.

[3] The New Jersey Zinc Co., 160 Front St., New York 7, N.Y.

[4] Manufactured by Edward C. Balloux, 115 Hudson St., New York 13, N.Y.

[5] Metals Disintegrating Co., 901 Lehigh Ave., Elizabeth, N.J.

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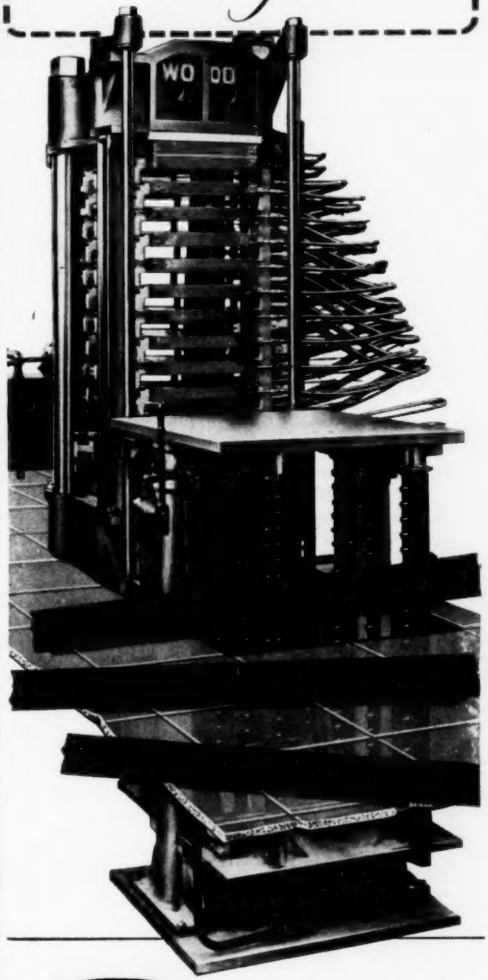
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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Imports and Exports

IMPORTS of chemicals this year have contributed in substantial quantity to plastics production. Take benzol for example. Without large importation of this chemical, styrene and phenolic production would have been considerably less in the first half of the year. Foreign benzol is mostly crude and, when refined, gives about 70 parts of benzene to 100 parts of usable material. It is expected that betwen 50 and 60 million gal. net will be obtained from foreign sources by the end of the year.

The principal supplier has been England with about 28 million gal. in the first seven months. Belgium and the Netherlands were the only other suppliers of any sizable quantity. Polish and Czech benzol stopped coming to the United States late in 1950. This foreign material has cost a premium price—some of it as high as 60¢ a gal. after refining, in comparison to domestic benzene from petroleum at around 50¢ a gal. and 30¢ from coal tar.

A much larger supply of naphthalene has been coming in than was expected. The quantity from England, a former big supplier, has diminished to zero since April, but ever increasing quantities from Germany (April was high month with 4 million gal.) and West European countries helped. Poland and Czechoslovakia also sent over 1 million gal. a month until May. Turkey contributed a total of about 1½ million gal. through July.

The import figures for polyethylene, acrylic sheets, urea, melamine, and rigid vinyl are not available since they are reported in miscellaneous categories.

The export figures contain rather large quantities of chemicals that went mostly to Canada, and surprisingly large quantities of plastics, considering the scarcity of most of them in the United States. Whether or not this rate of exportation may continue or grow is a question, since American companies have built or are now building plastics plants in nearly all quarters of the globe except behind the Iron Curtain.

* Reg. U. S. Pat. Office.

Imports and Exports of Plastics and Raw Materials Used in the Plastics Industry [a,b]

	1950	*1st 7 mo. 1951*
IMPORTS (In pounds unless otherwise stated)		
Benzol (gal.)	23,290,063	32,247,907
Cresylic acid	3,487,411	2,770,608
Naphthalene, solidifies at under 79°	110,800,026	49,565,464
Naphthalene, solidifies at over 79°	1,427,704	1,848,190
Phthalic anhydride	1,368,508	170,139
Cresol, all types	1,270,512	626,971
Hexamethylene tetramine	20,341	329,014
Vinyl acetate, unpolymerized	3,835,770	2,215,761
Vinyl acetate, polymerized	291,197	1,620,947
Cellulose acetate sheets	80,700	81,112
Cellulose acetate block, rod, etc.	133,354	309,858
EXPORTS		
Phenol or carbolic acid	14,049,467	6,988,004
Cresylic acids and cresol	2,962,806	2,832,781
Phthalic anhydride	2,802,333	3,802,741
Formaldehyde	23,517,998	18,197,652
Polystyrene	26,450,830	13,711,076
Vinyl chloride (includes film and sheet as well as compound)	31,640,228	22,761,715
Urea and melamine	11,877,592	9,985,126
Cellulose nitrate sheets	537,126	252,258
Cellulose acetate molding material	5,778,511	3,872,216
Cellulose acetate sheets	953,132	701,580
Vulcanized fiber sheets	5,885,114	5,054,744

[a] Source: United States Imports and Exports of Merchandise for Consumption, by Bureau of the Census.
[b] Figures for first seven months are all that are available at press time.

California Resorcin Plant

AUTHORIZATION to build a $600,000 resorcin manufacturing plant in Dominguez, Calif., has been granted to Borden Co.'s Chemical Div. by the National Production Authority because the critical shortage of that material is hampering production of vital defense materials. The plant will occupy 100,000 sq. ft. of space and will be constructed on a 7½-acre tract acquired from Stauffer Chemical Co.

The Dominguez operation—first resorcin plant on the West Coast—will produce at least 1,000,000 lb. of technical grade resorcin annually. Other products include resin glues for the Southern California furniture and woodworking trade and industrial resins for the plastics molding and compounding industry in the area. Production of molding compounds is also contemplated. Herbert H. Clarke, Jr., a vice president of the Chemical Div., will manage the plant.

S.P.I. Slogan Contest

ANNOUNCEMENT has just been made of the prize-winning slogans in the contest conducted by the Fifth National Plastics Exposition sponsored by the S.P.I. First prize award of $500 was given for the slogan "Plastics Personify Progress." Author of this slogan is George Whyte, vice president and sales manager of The Dominion Comb & Novelty Co., Montreal, Canada.

Second prize of $200 was awarded to Gino Paccioretti for the slogan "Choose Plastics for Performance." Mr. Paccioretti is an engineering draftsman and designer with Columbia Protektosite Co., Carlstadt, N.J.

The slogan "Plastics Make Things Better for Everybody" was awarded the third prize of $100. This slogan was submitted by Colin C. Camp-

PLASTISCOPE

bell, advertising manager of Rohm & Haas Co., Philadelphia, Pa.

The slogan contest drew 2367 entries from all branches of the plastics industry here and abroad. Judges were Vice-Admiral Charles W. Fox, Chief of Naval Materials, U.S. Navy; Ben Hibbs, Editor of *The Saturday Evening Post;* and Mayor Bernard Samuel of Philadelphia.

The Fifth National Plastics Exposition will take place March 11 through 14, 1952, in Convention Hall, Philadelphia.

Polyester Plant

FACILITIES for the manufacture of Selectron, a polyester resin, are under construction at Springdale, Pa., by Pittsburgh Plate Glass Co. The material is used as an impregnating agent in war products where a lightweight, bullet-resisting, and weather-resisting product is required. The new plant will adjoin the company's paint manufacturing unit.

Site for Methanol Plant

SIXTY acres of land adjacent to the Houston Ship Channel, Houston, Texas, have been purchased by Heyden Chemical Corp., 393 Seventh Ave., New York, N.Y. The company plans to construct a plant on this site for the production of methanol and a variety of other products.

CAA Production

WITH the acquisition of Aircraft Specialties Co., Inc.'s interest in cellular cellulose acetate, Strux Corp., Hicksville, N.Y., becomes the sole manufacturer at the present time of that expanded plastic material under patents held by Du Pont, original developer of the product. Strux Corp. is planning to put additional equipment into operation to increase the availability of the material tenfold. Paul Witte has been named to head the development and production programs of the firm.

Marketed as Strux, one of the material's most important applications is in core material for sandwich laminates. Because of the sealed cellular nature of the material, it has high efficiency in the fields of flotation and thermal insulation. Its excellent dielectric qualities suggest its use in the manufacture of x-ray and electronic equipment.

High Heat Insulation Material

TO MEET the demand of manufacturers of electrical equipment for an extra-thin, high heat insulation, Irvington Varnish & Insulator Co., Irvington, N.J., has introduced a new insulation known as Silicone Resin Coated Novabestos. The product is 0.003 in. thick, and can be used at operating temperatures of 180° C., which places it in the category of Class "H" insulation. It is composed of 97% asbestos and 3% organic material; its long fiber construction gives it unusual physical properties for such a thin material.

Phenol for Canada

THE new phenol plant in Montreal to be erected for British American-Shawinigan, Ltd., which was announced last summer and which will produce phenol by a new process from cumene, a petroleum derivative, will be built by the Canadian Kellog Co., Ltd. a subsidiary of M. W. Kellogg Co. B.A.-Shawinigan is a new company jointly owned by British American Oil Co. and Shawinigan Chemicals Ltd. The new plant, which will produce 13 million lb. of phenol annually, will, together with Standard of California's new Pacific Coast plant, be the first commercial units of their type and will employ a process under license from Hercules Powder Co., Wilmington, Del., and Distillers Ltd., London, by which cumene is oxidized to produce both phenol and acetone.

New Fibrous Glass Plant

FIRST Fiberglas to be produced by the new Fiberglas Div., Libbey-Owens-Ford Glass Co., came out of the plant on November 16. The initial output was to be used by the United States Navy for flotation purposes. Another unit for production of super-fine fibers for automotive, aircraft, refrigeration, and other industries was scheduled to start on December 15.

Also announced by Plaskon, a division of Libbey-Owens-Ford, is a new material made of Fiberglas and alkyd resin. The material is reported to have higher impact strength than any other plastic material. Not a new combination, this particular compound is unusual in that it is supplied already mixed and can be easily molded or fashioned into various shapes by conventional methods of molding. It is known as Plaskon reinforced alkyd molding compound and is being studied for bullet-proofing, as well as use in guided missiles, projectile heads, and telephone handsets. Civilian uses are foreseen in refrigerators, washing machines, electronic devices, and some automobile parts.

Low-Exotherm Polyesters

ADDITION of two new low-exotherm resins to its line of polyesters has been announced by Marco Chemicals, Inc., Linden, N.J. Designated MR-31C and MR-31V, both resins can be cured at moderate elevated temperatures or at room temperature through the use of a paste catalyst and accelerator supplied by the manufacturer. These resins reach full cure within 24 to 48 hr. following gelation without application of external heat. If full cure is desired immediately, heat may be applied. Neither resin is subject to air inhibition and both will cure tack-free in the presence or absence of air.

Coated Fabric and Sheeting

SEPTEMBER shipments of vinyl and pyroxylin coated materials reported by members of the Plastic Coatings & Film Association totaled 3,457,843 linear yd. compared to an August figure of 3,315,150 yd. and a September 1950 total of 3,690,581 yards. Sheeting (vinyl film over 10 mils thick) shipments were 3,807,399 sq. yd. in September 1951 compared to 4,201,569 sq. yd. in August 1951, 4,980,288 sq. yd. in September 1950.

The Association reports represent 62% of the coated fabric shipments and 80% of the sheeting shipments.

The pyroxylin coated portion of the above coated fabric figure was 1,794,584 linear yd. in September 1951 compared to 3,024,114 yd. in September 1950.

Government business for Septem-

ber 1951 was approximately 40% of shipments of plastic coated material compared to 30% in August. Paul F. Johnson, secretary of the Association, predicts that the industry as a whole will end the year with shipments just about on a level with those in 1950, with the largest volume shipments in the last half of 1950 and the first half of 1951.

Strip Perforated Polyethylene Bag

DEVELOPMENT of a new type of strip perforated package has been announced by Better Bags, Inc., 840 N. 6th St., Philadelphia, Pa., fabricators of polyethylene for packaging uses. Marketed under the name of Oto-Strip, the new bags are produced in continuous rolls with perforations between each pocket. Positive seal lines on each side of the perforation produce a perfectly sealed bag or pocket which can be torn from the strip. Pocket sizes range from 1 by 1 in. to 5 by 6 inches.

Machinery Contest

IN AN effort to stimulate interest in used equipment now available during the emergency, the First Machinery Corp. has announced a $1500 prize contest open to any person connected with the chemical and allied industries. The company will award $100 each month for a year, starting November 1951, for the best statement on the subject: "My Happiest Experience With Used Equipment." At the end of the year a grand prize of $300 will be awarded for the best article. All entries should be sent to Contest Editor, First Machinery Corp., 157 Hudson St., New York 13, N.Y.

Canadian Petro-Chemical Plants

A $50 million petro-chemical plant is being built by Canadian Chemical Co. Ltd., an affiliate of Celanese Corp. of America, on a 430-acre site at Edmonton, Alberta. James A. Stenstrom has been named sales manager of the plant, which will produce pentaerythritol, methanol, propylene glycol, dipropylene glycol, n-propanol, and n-propyl acetate, in addition to acetic acid, acetone, acetaldehyde, formaldehyde, and n-butanol.

Celanese also announces the formation of another subsidiary, Petrocel Corp., to carry on oil and gas development work in Texas, where Celanese operates a chemical plant at Bishop and has a second plant under construction at Pampa.

Immediate construction of a new 20 million lb. carbon black plant has been announced by Cabot Carbon of Canada, Ltd., at Sarnia, Ontario. Representing an investment of over $2 million, the enterprise is under the direction of Louis W. Cabot, vice president.

Division Changes Name

AS PART of a $20 million expansion program in the field of surfactants, (industrial surface active agents) intermediates, acetylene chemicals, and allied products, Antara Products, a division of General Dyestuffs Corp., has changed its name to Antara Chemicals. Headquarters remain at 435 Hudson St., New York 14, N.Y. The company, which handles sales and services of the above mentioned products made by General Aniline & Film Corp., was originally formed Oct. 1, 1950, in a merger with the Organic Chemicals Div. of General Dyestuffs.

Acrylic Rubbers

INITIAL commercial production in this country of two new acrylic rubbers has been announced by American Monomer Corp., Leominster, Mass., under the trade name of Acrylon BA-12 and Acrylon EA-5.

Acrylon BA-12 shows excellent low temperature characteristics and is resistant to heat, hot oils, boiling water, oxygen, ozone, and sunlight. Acrylon EA-5 has less low-temperature flexibility but has increased oil resistance.

Triallyl Cyanurate

PILOT plant quantities of triallyl cyanurate are being made available for the first time by American Cyanamid Co. Most promising application for this new monomer is in the field of plastics and resins. For example, mats prepared by polymerizing triallyl cyanurate on glass cloth have high flexural strength even at temperatures as high as 230° C. Copolymerizations are also readily carried out since triallyl cyanurate is compatible with many other monomers and with alkyd resins. Use of such polymers and copolymers is recommended in applications requiring heat and chemical resistance.

Physical and chemical properties of triallyl cyanurate are discussed in New Product Bulletin No. 21, and inquiries should be directed to New Product Development Dept., American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N.Y.

Decal Simulates Wood and Marble

EVEN amateur craftsmen can apply Plastic Veneer, a decalcomania produced by Meyercord Co., 5323 West Lake St., Chicago, Ill., from photographic reproductions of wood grains and marbles, with a specially developed slow setting cement. The veneer sheet is available in two sizes—6 and 12 sq. ft.—and the company has just set up a Plastic Veneer Dept. which will handle distribution.

More Concentrates

EXPANDED facilities have increased production of Arwax Concentrates produced by American Resinous Chemicals Corp. The products are concentrates of synthetic rubbers and resins in paraffin and micro-crystalline wax which are used to improve the adhesion, flexibility, heat-seal, anti-blocking, and gloss properties of paraffin and micro-crystalline waxes. Arwaxes currently offered are butyl rubber, Vistanex, S-polymer, polyethylene.

Finishing Treatment for Glass

STRONGER, more waterproof bonding in Fiberglas-reinforced plastics is said to result when a new chemical finishing treatment developed by Owens-Corning Fiberglas Corp. is applied to fabric which is used to reinforce polyester resin in molded laminates. The new finish is designated No. 136. Formerly, plastic parts, such as those used in military aircraft, lost up to 50% of their strength after prolonged immersion in water. Use of the new finish reduces strength loss to less than 10 percent.

Tests conducted at Owens-Cor-

ning laboratories show that molded laminates made with glass cloth treated with Finish No. 136 possess flexural strengths above 60,000 p.s.i. after immersion in water for 30 days. Since polyesters tend to absorb moisture from the air, the finish gives added strength whether or not the laminate is actually subject to prolonged soaking in water.

Application of the new finish, which is performed on standard textile treating machinery, is expected to extend uses for parts for airplanes, amphibious vehicles, military and pleasure boats, corrosion resistant pipe, and other items as well as to result in the upgrading of specifications established by the Armed Services for performance of Fiberglas-plastics items.

Thin Metalized Acetate

DEVELOPMENT of a 0.001-in. metalized acetate material by Coating Products, 136 W. 21st St., New York, N.Y., offers convertors a substitute for foil paper, which is becoming increasingly difficult to obtain. Because of its flexibility and pliability, the new material can be used for many purposes in sheeting form. It can also be laminated to paper and board, thus providing the same attractive effect as foil but with the additional advantage of a protective surface since the color is coated underneath the acetate. In this connection it is finding wide acceptance among display manufacturers and point-of-sale merchandisers.

The metalized acetate is available in eight colors—silver, gold, royal blue, red, chartreuse, green, pink, and orchid. It is produced in 20-in. widths in rolls up to 2000 ft. in length or sheeted to specifications.

COMPANY NOTES

Fred S. Carver, Inc., has moved its office and laboratory to 1 Chatham Road, Summit, N. J.

Wess Plastic Molds, Inc., has added 5000 sq. ft. to its present factory at 601 Second Ave., New Hyde Park, N. Y.

Russell Reinforced Plastics Corp., Hicksville, N. Y., has been formed to manufacture reinforced plastic laminates and flat board stock of Fiberglas-polyester construction. Alfred W. Russell is president of the new firm.

American Hard Rubber Co. has moved its offices to 93 Worth St., New York 13, N. Y.

Thomas Mfg. Corp., 80 Clinton St., Newark, N. J., recently opened its third plant at 17 Lawrence St., Newark. The 25,000 sq. ft. plant is part of the firm's expansion program to meet the demand for plastic toys, dolls, novelties, and household items.

Shell Chemical Corp. recently opened a new sales office in Atlanta, Ga., under the management of **M. W. Ellison.**

Associated Plastic Companies, Inc., has announced the election of **Jay J. Seaver** as president and **William Zabel** as executive vice president and general manager.

Palm Plastics, Inc., has moved to 1314 So. Dixie Highway, West Palm Beach, Fla.

Reed-Prentice Corp. has appointed **Western Molders Supply Co.,** Los Angeles, Calif., as exclusive representatives for its line of plastic injection molding machines and die casting machines in California, Arizona, and New Mexico.

Rogers Plastic Corp., West Warren, Mass., has promoted **Russell W. Nadeau** to assistant general manager and **John Krach** to works manager.

Falk Glass & Plastics Co., Inc., has moved to 48-10 Astoria Blvd., Long Island City 3, N. Y.

Claude P. Bamberger, Inc., has moved its plant and offices to 152 Centre St., Brooklyn 31, N. Y., where the company has additional facilities to process, sort, and decontaminate plastic scrap.

General Electric Co. announces the following personnel changes in the Chemical Div.: **William L. Rodich** has been promoted to assistant general manager of the Laminated and Insulating Products Dept.; **Earl F. Arnett** has been appointed manufacturing engineer for the Coshocton, Ohio, plant of the same department; and **K. Jerry Morray** has been transferred to the company's silicone plant at Waterford, N. Y.

Rogers Corp., Manchester, Conn., announces the election of **Timothy J. Mee** as director of the company and the appointment of **Benjamin B. Levy** as sales manager.

B. J. Barry & Co., Inc., 62 Worth St., New York, N. Y., has been formed to manufacture cotton fabrics for laminating purposes. The new firm is also sole selling agent for the mills formerly represented by Curran & Barry, recently dissolved.

Monsanto Chemical Co. has named **Wyllys Russell** as New England sales representative for the Plastics Division. **William W. Schneider** has been elected to the board of directors.

Columbia-Southern Chemical Corp. has named **C. F. Bingham** and **J. F. Dockum** assistant directors of sales with headquarters at the firm's main Pittsburgh office.

Gates Engineering Co., P. O. Box 1711, Wilmington, Del., produces and sells Dekadhese cement, having purchased the formulation, patent, and trade mark from the previous manufacturer, Technical Specialties Co.

Extruders, Inc., has become affiliated with **Pioneer Rubber Mills. W. S. Towne,** president of the latter firm, assumes the presidential duties of Extruders, Inc.; **J. C. Ballagh** continues as director; and **R. G. Kress** and **J. H. Farber** have resigned.

Pittsburgh Plate Glass Co. has appointed **Russell G. Whittemore** acting director of the glass division. He succeeds **J. Hervey Sherts** who was recently named general manager of the new **Fiber Glass Division.**

National Rubber Machinery Co. has opened an eastern sales office at 1180 Raymond Blvd., Newark, N. J., headed by **E. R. Coddington.**

Laminated Plastics, Inc., manufacturer of glass reinforced plastics, has changed its name to **The Glastic Corp.** No change in management, policy, or ownership has been made, and the firm still operates at 1823 E. 40th St., Cleveland 3, Ohio.

United States Rubber Co. an-

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nounces the appointments of **Thomas R. Grimes** as sales manager of U. S. Royalite plastic products and of **William M. Coy** as sales manager of U. S. Chemical Sponge.

Lithcote Corp. is the new name of **Lithgow Corp.**, applicator of protective baked phenolic coatings and linings. **Alexander T. Baldwin** has been promoted to president.

The company also announces that, in cooperation with **the Chemical Div., General Electric Co.** and **Shell Chemical Corp.**, it is applying two new baked coatings using the former's R-108 resin and the latter's Epon resin.

Sterling Electric Motors, Inc., announces the appointment of the following additional distributors of the company's electric power drives: **Allied Bearings Supply Co.**, 822 South Boulder, Tulsa, Okla.; **Berry Electric Co.**, 301 So. Third St., Walla Walla, Wash.; **Alabama Bearings Co., Inc.**, 7 Railroad St., Montgomery, Ala.; **Stanley Electric Motor Co.**, 1520 E. Miner Ave., Stockton, Calif.; and **Roy A. Berentz Co., Inc.**, 1400 Carr, P.O. Box 564, Houston, Texas.

Vopcolene Div., Vegetable Oil Products Co., Inc., announces the appointment of the following agents: The **B. E. Dougherty Co.** will serve as national sales distributor for Vopcolene products to the rubber industry, maintaining a principal office at 1807 E. Olympic Blvd., Los Angeles, Calif., and branch offices in San Francisco, Akron, Ohio, and at other important consuming centers; **Lotte Chemical & Dye Corp.**, Paterson, N. J., will handle east coast representation; sales to the Pacific Northwest will be served by **W. Ronald Benson, Inc.**, whose offices are located at 558 First Avenue South, Seattle, Wash.

PERSONAL

Richard L. Huber has been named manager of the Cleveland office of the **Cellulose Products Dept., Hercules Powder Co.**

James S. Wolff has been appointed Washington, D. C., representative of **B. F. Goodrich Chemical Co.**, succeeding R. H. Williams. Mr. Wolff joined the firm in 1946.

Dean M. Peebles has been added to the staff of the **Films & Flooring Div., The Goodyear Tire & Rubber Co.**

Osgood V. Tracy has been appointed director, **Chemical Div., National Production Authority.** Mr. Tracy, who is on leave as general manager of the **Chemical Products Dept., Esso Standard Oil Co.**, was formerly deputy director.

Willis L. Conn has been named comptroller for **The Rex Corp.**, 51 Lansdowne St., Cambridge, Mass.

Sam Gurley, Jr., has been named manager of Resin Sales for **The Barrett Div., Allied Chemical & Dye Corp.** Mr. Gurley, formerly associated with The Borden Co., will be in charge of Barrett's expanding operations in the resin field.

J. H. DuBois has been named sales manager of **Plax Corp.**, Hartford, Conn. **George E. Pickering** succeeds him as new product development manager.

Robert L. Fish has joined **William Whitman Co., Inc.**, as resident manager of the Plastics Mfg. Div., located at Lynn, Mass.

E. Brewster Crawford, formerly vice president and general manager of **Auburn Button Works, Inc.**, has been named president of the firm. He succeeds **Douglas Woodruff** who was elected chairman of the board, a newly created position. Mr. Crawford has been with the company since 1942.

F. A. Abbiati, general manager of the Plastics Div., has been elected vice president of **Monsanto Chemical Co.**

Francis E. Lee, formerly of Snedeker in Philadelphia, has joined **Fibre Specialty Mfg. Co.**, Kennett Square, Pa. This company has just entered the reinforced plastics field and Mr. Lee will superintend their efforts in that capacity.

H. Barden Allison has been named district sales manager of the Philadelphia branch, **Mechanical Goods Div., U. S. Rubber Co.**

Dr. Lloyd E. Parks, formerly of Sharples Chemicals, Inc., is now general manager of **Bee Chemical Co.** in charge of all production, research and development, and sales activities.

Marcel Pagerie has been appointed sales manager of **American Lucoflex, Inc.**, 1 E. 57th St., New York City.

Stan Peters has announced his resignation from **Monsanto Chemical Co., Plastics Div.**, which he joined in 1946. Mr. Peters is now a partner in **Doddridge-Peters & Associates,** 1711 W. 135th St., Gardena, Calif., which will act as sales representative for a number of manufacturers handling industrial parts for aircraft.

MEETINGS

Jan. 14-17—Plant Maintenance Show, Convention Hall, Philadelphia, Pa.

Feb. 21-22—Society of the Plastics Industry, (Canada), Ltd., 10th Annual Conference, Royal York Hotel, Toronto.

Mar. 3-7—American Society for Testing Materials, Spring Meeting and Committee Week, Hotel Statler, Cleveland, Ohio.

Mar. 11-14—Society of the Plastics Industry, Fifth National Plastics Exposition, Convention Hall, Philadelphia, Pa.

Mar. 16-19—American Institute of Chemical Engineers, Atlanta Biltmore Hotel, Atlanta, Ga.

Mar. 22-Apr. 6—Chicago International Trade Fair, Navy Pier, Chicago, Ill.

Apr. 9-11—Society of the Plastics Industry, Seventh Annual Technical Session, Reinforced Plastics Div., Edgewater Beach Hotel, Chicago, Ill.

June 23-25—Forest Products Research Society, Sixth Annual National Meeting, Milwaukee, Wis.

June 23-27—American Society for Testing Materials, 50th Anniversary and Annual Meeting, Hotels Statler and New Yorker, New York, N. Y.

S.P.E. Meeting

Jan. 16-18—8th Annual National Technical Conference, Edgewater Beach Hotel, Chicago, Ill.

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FOR SALE: 50 Ton Stokes Presses & Pump. 200 Ton W.S. Hobbing PRESS, 300 Ton W.S. PRESS 24 x 20 Platen, 175 Ton H.P.M. PRESS 30 x 30 Platen, 150 Ton Farrel PRESS 30 x 30 Elec. Plates. 140 Ton W.S. PRESS 22 x 17 Platens, 85 Ton Stewart Bolling PRESS 20 x 20 Platen, 50 Ton Elmes PRESS with 18 x 18 Elec. Plates, 75 Ton W.S. PRESS 15 x 15 Platen, 75 Ton Adamson PRESS 20 x 20 Platens. Laboratory presses. Accumulators. Piston and Oil Pumps. AARON MACHINERY CO., INC. 45 Crosby St., N.Y.C.

SAVE WITH GUARANTEED REBUILT EQUIPMENT — HYDRAULIC PRESSES. 24" x 24", 18" ram 318 tons; 24" x 56", 450 ton multiple opening; 24" x 24", 16" ram, 250 tons; 24" x 24", 12" ram, 170 tons; 24" x 42", 2—12" rams, 340 tons, 42" x 42", 16" ram, 250 tons; 36" x 36", 12" ram, 141 tons; 20" x 18", 10" ram 118 tons; 20" x 20", 10" ram, 118 tons; 19" x 24", 10" ram, 78 tons; 22' x 15', 8' ram, 75 tons; 27" x 21", 8" ram, 75 tons; 15" x 15", 8" ram, 75 tons; 12" x 12" 7½" ram, 60 tons; 12" x 12", 6½" ram, 50 tons; 8" x 9½", 4½" ram, 20 tons; 16" x 16", 3½' ram, 12 tons; Laboratory Presses; 10 ton Carver 6" x 6", Watson Stillman 30 ton, 6" x 6"; Laboratory Mills and Calenders (NEW) M. D.; THROPP Mill 16" x 40" M. D.; NEW DUAL PUMPING UNITS, all sizes; Extruders; Royle Rubber #2, Royle Plastic #1, PREFORM PRESSES, Stokes T. Colton, 5½ T and Stokes DDS4 with Reeves Drives, also Mixers, Vulcanizers, Accumulators, etc. Universal Hydraulic Machinery Company, 285 Hudson Street, New York City 13, N. Y.

We handle hydraulic presses, pumps, and power units of all sizes. Write us your requirements and we will try to help you. We find it impossible to list our equipment in this classified column due to the fact that the equipment is sold before ad is published. For those who seek action look in the New York Times under the Machinery and Tool Column for our regular Sunday Special. Hydraulic Sal-Press, Inc., 386-90 Warren Street, Brooklyn 2, N.Y. MAin 4-7847

FOR SALE: 1 Stokes DD2 Rotary Tablet Machine, Vari-Speed Drive and motor; 1—Farrel 16" x 42" Rubber Mill complete with drive and 75 H.P. Motor; 2—Ball & Jewel #2 Rotary Cutters, 50 H.P. Motors. Also Grinders, Extruders, Compression and Injection Molding Presses, Mixers, etc. Send us your inquiries. Consolidated Products Co., 13-14 Park Row, New York 38, New York.

FOR SALE: Thermex Preheater, Model 2P; Airtronics Preheater, Model D E; Airtronics Preheater, Model C B. Like new. AARON MACHINERY CO., INC. WOrth 4-8233. 45 Crosby St., New York 12, N. Y.

FOR SALE: One HPM Injection Molding Machine built 1946, 4 oz. $5,000, $2,000 down, machine operating daily. Jim Robbins Company, Detroit, Hazel Park, Michigan. Phone, Jordan 4-6634.

FOR SALE: 6 Rotary Pellet Presses: Kux model 25 (21 punch and 25 punch); Stokes D-3 and D-4. Read Co. 250 gal. heavy duty double arm sigma blade jacketed mixers. PERRY EQUIPMENT CORP.; 1429 N. 6th Street, Phila. 22, Pa.

FOR SALE: 4-oz. Impco Injection Molding Machine complete with motor. All controls including Nylon equipment. Purchased new this year. Run less than 60 days. F. J. Kirk Molding Co., Inc., Clinton, Mass. Phone: 1871.

FOR SALE: TO SETTLE AN ESTATE—2—Reed Prentice Plastic Injection Mold Machines as taken from service. Complete. Can be seen under power. No reasonable offer refused. NOLL EQUIPMENT COMPANY, 4533 St. Clair Avenue, Cleveland 3, Ohio. EXpress 1-0700.

FOR SALE: Injection Presses: 4, 9, 16 oz. HPM, 8 oz. Watson, 1—32 oz. Reed, 1—6 oz. Reed w. 8 oz. cyl., 22 oz. Impco, 2 oz. De-Mattia, 1 oz. VanDorn. Extruders: 1—1" Bench Lab., 1—2½ NRM. 1—Sheet Die 51" for NRM extruder & Takeup unit. 1—Johnstone 42" Slitting & Rewinding mach.—Scrap-grinder.—Despatch Ovens. 4—Miskella Infrared Dryers. 1—250 Tons Transfer press: Compression Presses: 50, 250 & 600 tons.—2—3KW Thermall Electronic Preheaters. 1—250 tons, 10 Plat. 26 x 28" Laminating press. Preformpresses: Stokes T & R, Kux No. 60 B and 65 B.—1—Nash Rotary Edger.—2—Embossing Calenders 61" wide. 1—Sheridan Embossing Press.—1—Patterson Stainl. Steel 8½ Cuft. Conical Blender.—1—7½ HP Vacuum Pump. Justin Zenner, 823 W Waveland Ave., Chicago 13, Ill.

FOR SALE: One Thermex High Frequency Unit manufactured by the Girdler Corp. Model 195X serial 8000T 8KW Freq. 5.6 MC using two oscillator and six rectifier tubes. Condition excellent. Extra new tubes co-axial cable and four poster upstroke twenty-five ton hydraulic press also available. Beacon Supply Co. Chelsea, Mass.

AT BARGAIN PRICES

Colton 2 and 3 RP Rotary Tablet Machines.
Mikro 1SH, 2TH, 3TH, 4TH Pulverizers; Jay Bee and Schutz O'Neill Mills.
Baker Perkins & Readco Heavy Duty Steam Jacketed, Double Arm 50, 100, 150 gal. Mixers.
Baker Perkins 150 gal. D. A. Unidor Jacketed Mixer.
Baker Perkins 100 gal. D. A. Vacuum Mixers.
J. H. Day 75 & 55 gal. Imperial and Cincinnatus D. A. Jacketed, Sigma Blade Mixers.
Day and Ross Pony Mixers 8, 15 gal. caps.
Hobart & Read Vertical Mixers, from 15 to 120 quart, with removable bowls.
Day & Robinson 100 up to 4000 lbs. Dry Powder Mixers.
Package Machy. FA, FA2, Miller, Hayssen 3-7, Scandia Auto. Cellophane Wrappers.
This is only a partial list. Over 5000 machines in stock—rebuilt and guaranteed —available at tremendous savings.

UNION STANDARD EQUIPMENT CO.
318-322 Lafayette Street
New York 12, N. Y.

FOR SALE: 8 oz. Reed-Prentice, 1942; 8 oz. Reed-Prentice, 1947; 9 oz. HPM, 1946; 8 oz. Lester, 1947. Reply Box 1323, Modern Plastics.

INJECTION MOLDING MACHINES	
1-Oz. Van Dorn, Model H200, 1947	Offers
1½-Oz. Impco, very good cond. (2) ..	7,500ea.
2-Oz. LEOMINSTER, semi-auto. 220/3/440	Offers
2-Oz. H.P.M. new '39, Mod. 10-A, excel.	$3,500
4-Oz. H.P.M. new '39, Mod. 10-A, excel.	$5,600
4-Oz. REED, ser. #57450cl; 15 HP 3/60	$9,700
4-Oz. Watson Stillman, new, #9730cl...	$9,950
6-Oz. REED, W&S, 1942up, Mod. 10-D	$6,500up
8-Oz. REEDS, Several avail., '42up	$8,000up
8-Oz. LEOMINSTER, ser. #140cl, excel.	$8,500
8-Oz. Lesters 1947, very good cond.	$11,000up
9-Oz. H.P.M. Mod. 200-89, good cond....	$5,950
16-Oz. IMPCO, REEDS, HPM, W&S	$15,000up
22-Oz. REED, 1946; Mod. 10-H, (2)	$19,500up
32-Oz. IMPCO & REED, 1949 & up	$26,000up
EXTRUDERS	
HARTIG 3½", Model 500, good cond. .	$4,450
HARTIG 1¼", electric heat; 15 HP G.E. motor	$3,500
NATIONAL 2½", late, oil heated, good	$6,500
HYDRAULIC COMPRESSION PRESSES	
1000 T. BIRDSBORO, 18" st. 28"x29"..	$9,950
450 T. H.P.M. new '46 w/turbo........	Offers
350 T. SOUTHWARD, 18"; 24x24" platens	$2,975
350 T. H.P.M. '46; self-contained.......	$9,500
275 T. W&S, platens 24x55"; 8" stroke	$2,975
240 T. Hardinge Platens 24x30", 12"...	$7,000
225 T. W&S angle type; 18x18", 14x22	$4,000
200 T. Farrel 14" ram, 24x24 platens...	$1,750
200 T. Standard Platens 44x44".........	Offers
170 T. BURROUGHS Transfer, 14" stroke	$1,850ea.
75 T. Standard '40 vertical & horiz.....	$1,950
50 T. W&S, & Johnson, others.........	$650up
MISCELLANEOUS	
Robinson Stock Grinder, 50 HP motor	$3,000
Vickers Powder plant 200,000# per mo.	Offers
Huskey #6 Marking machine..........	$950
Two-(2) 16 x 42 Rubber Mills....... ..	Offers
One-(1) 16 x 42 Rubber Mill	Offers
Farrel Two Roll Mill 16 x 42	$3,975
Farrel 16"x40" endcap rubber mill.....	$5,625
Wilson Snyder Pump 3200# 40 HP, good	$4,000
Federal Megatherm Induc. tablet curing machines	$1,600ea.
Grunder Hammer Mill type plas. grndr.	$1,200
Ball & Jewel #2½ plastic grinder.....	$3,000

EVEREADY SUPPLY CO. E. J. McCallum, Jr.
805 Housatonic Ave. 4-9471 Bridgeport, Conn.

FOR SALE: Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars address Box 1321, Modern Plastics.

FOR SALE: Royle 4½" Extruder. Extra long screw. Circulating oil heat, D.C. drive from A.C. motor generator. Excellent condition. May be seen in operation. Reply Box 1336, Modern Plastics.

MACHINERY and EQUIPMENT WANTED

WANTED: To Expedite Production—Rubber Making Machinery including Banbury Mixers, Heavy Duty Mixers, Calendars, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider a set up plant now operating or shut down. When offering give full particulars. P.O. Box 1351, Church Street Sta., New York 8, N. Y.

WANTED: Manufacturer desires to purchase 22 oz.—24 oz. injection molding machine. Will consider all offers. Bernard Edward Company, 5252 South Kolmar Ave., Chicago, Ill.

(Continued on page 210)

CLASSIFIED ADVERTISING

(*Continued from page 208*)

Manufacturer interested in purchasing 3-½", 4-½" or 6" extruders. Natl. Rubber, Modern Mchnry., or Hartig Preferred. Reply Box 1309, Modern Plastics.

WANTED: Four to five color 36 to 54 inch unit press Gravure. Reply Box 1319, Modern Plastics.

WANTED: Will buy plastic injection machine and plastic molds, all sizes. Please advise us what you have to offer. Also interested in buying Polystyrene. Will pay cash. Reply Box 1322, Modern Plastics.

WANTED: Injection Molding Machine. Either of the following: Laboratory size, 1 oz., 2 oz. or Van Dorn 1 or 2 oz. Must be in good condition, priced right. Reply Box 1327, Modern Plastics.

WANTED: Pelletizing Facilities for Molding Resin or will purchase Pelletizing Equipment. Reply Box 1328, Modern Plastics.

WANTED! WANTED! WANTED! INJECTION MOLDING MACHINES, AND PRESSES, ALL SIZES. ALSO ANY OTHER PLASTIC OR HYDRAULIC MCHNRY. Superior Machine Tool Co., 803 Housatonic Ave. Bridgeport, Conn. 5-5890.

WANTED—one 4 oz. vertical injection press, vertical type Watson-Stillman or De Mattia. Perfect operating condition. Plastic Products, Inc., Pine Street, South Norwalk, Conn.

WANTED: by manufacturer at once Extruder 2½" NRM electrically heated with drive. Must be recent model in good condition. Reply Box 1340, Modern Plastics.

MATERIALS FOR SALE

FOR SALE: 18,000 lbs. pelletized, reprocessed polyethylene, free of contamination. All colors, or colored to your specifications. Also, we custom grind, pelletize, clean and remove contamination of your Plastic scrap. Best Electronic Co., 4822 8th Ave., B'KLYN 20, N. Y. Gedney 5-6776.

FOR SALE: 15 Tons Cellulose Acetate Sheet Material. Thicknesses 1.mm. to 6.mm. in all colours. Standard size sheets. Reply 1305, Modern Plastics.

LUCITE—PLEXIGLASS—GLACITE SHEETS—CAST RODS Always in stock—we deliver. PLASTICS GLASS CORP., 33 Ave. P., Newark 5, N. J., Mu 7-6477.

BUY—BARTER—SELL: Phenol—Phthalic—Maleic—Glycols—Titaniums—Zinc Oxides—Hydrosulfite — Bichromates — Ethanolamines — Pine Oil—Benzol—Dyes—Colors, etc. CHEMICAL SERVICE CORP., 96-04 Beaver St., New York 5, N.Y.

FOR SALE: Reground Cellulose Acetate Molding Powder, MS flow; 5000 lbs. Shell, 1500 lbs. White, 3000 lbs. Assorted Pastel Colors. Also 5000 lbs. Ethyl Cellulose, Assorted Pastel Colors. Reasonably priced. Black, reprocessed Polyethelene pellets 3000 lbs. Reground CA Molding Powder. Reply Claude P. Bamberger, 152 Centre Street, Brooklyn 31, N. Y. Tel. MAin 5-5553.

FOR SALE: Fiberglas mat trimmings.
Treatment 8 and 16 (mixed).
Predominantly 2 oz. per sq. ft.
Widths 8" to 12" and random lengths up to 12'.
Price 15 cents per lb.
Widths over 12" and random lengths up to 12'.
Price 25 cents per lb.
All prices F.O.B. Houston. CORRULUX CORP., P.O. Box 20026, Houston 25, Texas.

MATERIALS WANTED

WANTED: PLASTIC Scrap or Rejects in any form. Acetate Butyrate, Polystyrene, Acrylic, Vinyl Polyethylene, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding, magnetizing and compounding. Reply Box 1301, Modern Plastics.

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic and Ethyl Cellulose. Reply Box 1302, Modern Plastics.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate. Custom grinding, magnetizing, compounding, and straining of contaminated plastics. Franklin Jeffrey Corporation, 1671 McDonald Avenue, Brooklyn, N. Y. ES 5-7943.

SURPLUS CHEMICALS BOUGHT: Turn your obsolete and excess inventories of chemicals into useful cash. Pyramid service is prompt, informative, and helpful. Pyramid prices are higher. WRITE — WIRE — OR PHONE US AT RITTENHOUSE 6-6592. PYRAMID CHEMICAL COMPANY, 1343 Arch St., Phila. 7, Pa.

WANTED: scrap Polyethylene rejects, or scrap Polyethylene camel back. Any color, any quantity, top prices paid. Also, custom grinding, pelletizing, cleaning and reprocessing of your own Plastic scrap. Best Electronic Co., 4822—8th Avenue, Brooklyn 20, N. Y. Gedney 5-6776.

WANTED: Vinyl scrap. Send samples and state price wanted. Reply Box 1315, Modern Plastics.

WANTED: Plastic scrap, rejects, and surplus molding compounds, such as Cellulose Acetate, Vinyls, Acrylic, Ethyl Cellulose, Polystyrene, Butyrate, etc. Also custom grinding, cleaning, and reprocessing of your own plastic scrap. Reply Claude P. Bamberger, Inc., 152 Centre St., Brooklyn 31, N. Y., Tel. MAin 5-5553.

Manufacturer needs sources for continuous supply and also individual lots of reground polyethylene of good quality. Reply Box 1342, Modern Plastics.

MOLDS WANTED

MOLD WANTED for injection molding. We will buy one mold or a complete line or series of molds for finished resalable items. Housewares, toys, novelties, etc. Will also buy molds for industrial parts such as handles, knobs, drawer pulls, gears. All items for resale in U. S. A. Send detailed information to Victory Manufacturing Company, 1722 W. Arcade Place, Chicago 12, Illinois.

WANTED INJECTION MOULDS of stationery and school plastics items by responsible Chilean firm, for rental. All suitable guarantees offered. Willing to enter into continuous contractual arrangement with responsible American firm. Reply Box 1312, Modern Plastics.

MOLD WANTED: Consumer items, Household, toy, to be used with 4 and 8 oz. REED PRENTICE injection molding machine for export. Submit samples from molds offered. Reply Box 1313, Modern Plastics.

WANTED: Plastic Molds—for 8 oz. Reed Prentice Machine. P. O. Box 59, Kent, Ohio.

SITUATIONS WANTED

Gen. Mgr., or Plant Superintendent, Age 42, B.Ch.E. and S. E. 18 years experience in varied plastic industries. Calendering, extrusion, casting, lamination, coating, printing and resin manufacturing with large nationally known companies. Have thorough knowledge of production and inter-departmental relations thereto; personnel management, maintenance, budget control, purchasing and public relations. Capable of assuming full charge. Family. Will locate. Invite contacts. Reply Box 1349, Modern Plastics.

Plastic Mold Designer—6 yrs. experience, injection, transfer, and compression molds. Also jigs and fixtures. Tool room experience. Desire connection with large or small firm in Detroit, Mich. area. Reply Box 1329, Modern Plastics.

Chemical Engineer, age 26, 2 years experience in research, development, and production of plastics extrusion. 1 year experience in reinforced polyester-fiberglas. Now employed with large reinforced plastics company as plant engineer and research director. Desire position with responsibility and future. Reply Box 1307, Modern Plastics.

Sales opportunity desired by man having a long record of experience handling thermo setting resins, adhesives and molding compounds in the North-Eastern states. Also familiar with laminates. Interested in connection with well established firm desirous of expanding their sales through man having excellent contacts. Commission part time basis would be considered. Reply Box 1330, Modern Plastics.

HELP WANTED

PLASTICS ENGINEER: Engineering degree and experience in molding and extruding operation general thermo-plastics. Will have full product engineering responsibility covering all plastics products manufactured. Salary open, dependent on qualifications and experience. Products specifically in industrial rather than novelty field. Established company with plant located in North Jersey area. Send resume outlining pertinent details to Box 1310, Modern Plastics.

COATER ENGINEER OR FOREMAN—Excellent opportunity for experienced man to assume responsibility over new department being set up in old, established firm. Experience necessary with organisols and plastisols. Reply stating all personal qualifications and business experience. All replies confidential. Reply Box 1303, Modern Plastics.

WANTED: Graduate engineer with approximately five years experience in testing or application of plastic materials, primarily thermosetting and thermoplastic molding materials and laminates, having a good knowledge of their physical properties. Position in Plastics Laboratory of large New York State manufacturer of precision electro-mechanical devices. Send full details of education and industrial experience. Reply Box 1304, Modern Plastics.

Leading custom precision injection molder with full die shop facilities located in New Jersey desires agent representation on a commission basis in Chicago, Detroit, New England, Philadelphia and St. Louis, Mo. Full cooperation and account protection on contract basis. We are highly experienced in assembly work with a capacity up to 20 ounces. Replies will be held in strictest confidence. Reply Box 1306, Modern Plastics.

(*Continued on page 212*)

CLASSIFIED ADVERTISING

(Continued from page 210)

WANTED: Sales representatives for phenolic resins (liquid types preferred.) Will consider commission basis arrangement or salary and commission both. Reply Box 1308, Modern Plastics.

SALES ENGINEERS
One of our clients requires technical representatives for expanding sales force to sell fibrous and plastics materials and fabricated parts. Engineering graduates, age 28 to 35 preferred, with proven ability to build and maintain technical contacts. Men chosen will join long-established, progressive company. Commission and expenses, with good earnings possibilities. Open territories: Chicago area, New York State, excluding New York City; Philadelphia area, and Pittsburgh, Ohio, Kentucky territory. Submit complete resume, earnings record, references and photo promptly for personal interview in your city. All replies confidential. The Charles Brunelle Company, 15 Lewis St., Hartford 3, Conn.

Glass Tubular Fishing Rod Engineer wanted in the east to set up complete plant with equipment for producing fishing rod shafts of all sizes on production basis. Give complete background and personal qualifications, in confidence. Reply Box 1314, Modern Plastics.

SALESMEN WANTED to sell line of aluminum mouldings and plastic wall tile, straight or side line. Commission basis. National Aluminum Company, 1139 Alum Creek Drive, Columbus 9, Ohio.

COATING CHEMIST: Coating machinery manufacturer is desirous of obtaining services of chemist familiar with organosols, plastisols and hydrasols coating on webs and monafilaments. Must be able to provide compound data and actual runs on large scale pilot equipment. Familiar with nylon, dacron, similar synthetics and rubber and their treatments. To assume charge of laboratory on new process development. Excellent opportunity for proper advancement. University graduate preferred. Central states location. Send complete detailed background resume. Reply Box 1325, Modern Plastics.

WANTED: Chemist for manufacturing of phenolic molding compound and synthetic resins. Should have experience with resins. Fine opportunity for advancement with growing company near Los Angeles, California. Call or write Loven Chemical of California, Newhall, California, Telephone Newhall 400.

PLASTIC DIVISION NIGHT SUPERINTENDENTS: Two high-calibre men needed to handle supervision of night shifts at large Chicago concern engaged in injection molding, extrusion, and sheet-forming. This is not a foreman's job. Mechanical engineer preferred but not essential. Salary open. Send complete resume of education and experience. Reply Box 1333, Modern Plastics.

SPLENDID OPPORTUNITY for man to promote the sale of a new type of hardboard manufactured from granulated wood and resin to the industrial trade. Some technical knowledge of hardboards and plastics necessary. This product manufactured by a large and well established firm. Give qualifications and references. All information confidential. Reply Box 1334, Modern Plastics.

GLASS FIBER PLASTICS TECHNICIAN: Education at least two years mechanical engineering. Experienced in development, production, tool design and processes. Write stating age, experience, etc., and salary expected. Inquiries strictly confidential. Reply Box 1335, Modern Plastics.

PLANT SUPERINTENDENT OR FOREMAN required for small midwestern injection molding division of old established firm. Must have complete knowledge of injection molding, assembly of parts, shop costs and management. Practical mechanical ability a "must" but wide foremanship experience not required. Seeking opportunity in preference to top wages. When replying, please state all qualifications, giving age, experience and education. Reply Box 1338, Modern Plastics.

WANTED: Foreman—Familiar with refrigeration and industrial applications for large injection molding plant located in New York area. Reply Box 1339, Modern Plastics.

CHEMISTS, CHEMICAL ENGINEERS, MECHANICAL ENGINEERS, TECHNICAL REPORT WRITERS, FOR RESEARCH AND DEVELOPMENT: Excellent opportunities for capable young graduates in process and product research and development in the laboratories of a progressive molder and fabricator of plastics. Experience desirable but not essential. In reply give full resume of education, experience and salary requirements to: VICTORY PLASTICS CO. Dept. M, HUDSON, MASSACHUSETTS.

YOUNG COLLEGE TRAINED ENGINEER, preferably M.E. to handle product development of all thermoplastics with progressive New England Company. Experience in thermoplastics desirable but not essential. Send complete resume giving education, experience and salary commanded or required in first letter to Box 1320, Modern Plastics.

PLANT SUPERINTENDENT required by a small Midwestern compression molding and laminating plant. Must have complete knowledge of compression molding, impregnation of cloth, paper, etc., as well as painting of finished products. Must have knowledge of labor relation and all the matters pertaining to production. This is an excellent opportunity with a growing company. Reply Box 1343, Modern Plastics.

Well established phenolic laminating and compression molding plant has a very good opening for an experienced chemical engineer familiar with all phases of this and development engineering work. Please reply giving complete details of past experience and salary requirements. Reply Box 1344, Modern Plastics.

An expanding midwestern compression molding and laminating plant offers a good opportunity to an experienced chemist with a background which would be valuable especially in development work and improving the standard of present products. Please give complete details and salary requirements to Box 1345, Modern Plastics.

Old established injection molder needs practical, technical instruction from experienced man in establishing extrusion division. Prefers contract or fee basis for developing tools and technique for specific product. Also might employ right man as manager or foreman. Reply Box 1342, Modern Plastics.

SIDELINE SALESMAN: Well established studio (Contract work) in painting-decorating screening (First class designer) of all kinds of material and capable of very large production in quality work desires sideline salesman calling on plastic manufacturers throughout the country. High commission. Excellent opportunity. Reply Box 1324, Modern Plastics.

MISCELLANEOUS

Mechanical Engineer in position of manufacturers representative seeks plastic products for use in manufacturing plants. Territory of Michigan north of Detroit covered. Reply Box 1311, Modern Plastics.

INJECTION MOLDING WORK AVAILABLE
We want to make arrangements with additional custom molders for expanding proprietary line. Volume large and constant—items not seasonal. Molds from 4 to 20 ounce now ready for immediate use on Reed-Prentice and Watson-Stillman Presses. We also have other new and original plastic items for sale or manufacture on a royalty basis. Replies held strictly confidential. Reply Box 1331, Modern Plastics.

CAPITAL PLUS SERVICES
Executive, 36, graduate product designer and engineer with 15 years of manufacturing, merchandising and product development and design experience in plastics and metals fields desires to purchase 50% or 100% interest in established, profitably operated plastics company or merchandising concern. Must be eastern U. S. Ample capital. Would participate actively. Reply Box 1316, Modern Plastics.

MOLDER—Fabricator wanted to produce plastic or polystyrene patented adjustable measuring cup. Available by patentee to complement manufacturer's own line or joint venture or can you give me price to produce for my account. Exciting item for the women as gift, store or premium article excellent sales booster. With television and other promotion sure to catch on like popular songs. Reply 1332, Modern Plastics.

Canadian distributor covering major department, chain and retail stationery stores, wishes to contact molders and fabricators with proven lines. If you have a good product, can guarantee deliveries and are interested in a Canadian market. Reply Box 1346, Modern Plastics.

COSTS too high? Material short, labor too high and unsatisfactory? Electro Forming is versatile, cost saving, one piece or production quantity. Ferrous, non-ferrous, some alloys. Quality hard to get by other methods. Years of manufacturing experience, top levels, plus technical "know how" on this subject. Consultation, problem analysis, research, development, retainer basis. Reply Box 1347, Modern Plastics.

FOR SALE: One 6-cavity special designed SOAP-BOX Mold; One 6-cavity SOAP-DISH Mold; One novelty Cig. Case Mold; Several Comb-Molds, 5, 7, 9" and one 8½-inch Rat-tail Comb-Mold. All Molds to fit the 8-ounce Reed-Prentice or any other 8-ounce injection Machine. Molds are guaranteed almost new, and in every respect in excellent and perfect working conditions for immediate possession. Reply Box 1348, Modern Plastics.

200 NEW PRODUCTS: We are designers and engineers specializing in New Product Design and Development for many of America's best known Consumer Goods manufacturers. In our files today are over 200 basically NEW PRODUCTS, many completely developed and almost all using plastics. We seek substantial and reputable concerns who are interested in the manufacture and/or marketing of proprietary products with whom we can place these products. The products cover the fields of

Children's Accessories	Juvenile Products
Furniture	Lamp & Lighting
Giftwares	Notions & Novelties
Hardwares	Office Equipment
Home Appliances	Office Supplies
Home Furnishings	Plastics
Housewares	Packaging
	Toys

Reply Box 1317, Modern Plastics.

FOR SALE: Injection Moulding Plant—Consisting of 1—2 oz. Van Dorn, 1—Cumberland Grinder Model # 0. All equipment brand new. Approximately 2500 lbs. of Styrene. Reply Box 1318, Modern Plastics or call LO 3-1352.

Graduate chemical plastic engineer, age 42, with twenty years practical experience in all phases of plastics manufacturing, desires one or two gentlemen interested in setting up a small modern hard hitting injection molding operation with compression to follow. (Sales experience desirable.) Preferred location, Virginia or North Carolina, but would consider other. Reliable references in the industry gladly furnished. Reply Box 1326, Modern Plastics.

All classified advertisements payable in advance of publication

Up to 60 words . $ 7.50	Up to 120 words $15.00	Up to 180 words $22.50
Up to 60 words (boxed) $15.00	Up to 120 words (boxed) $30.00	Up to 180 words (boxed) $45.00

For further information address Classified Advertising Department, Modern Plastics, 575 Madison Ave., New York 22, N.Y.

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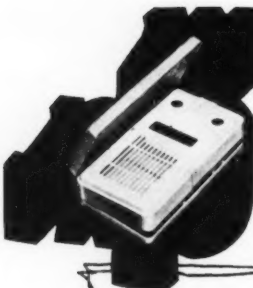
JANUARY 1952

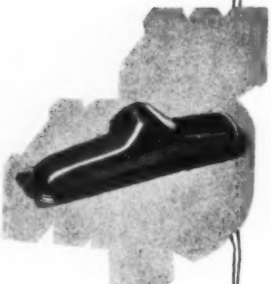
(Continued on page 216)

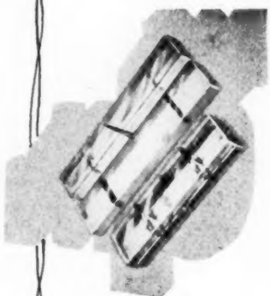
MODERN PLASTICS

575 MADISON AVENUE • NEW YORK 22, N.Y.



YOUR Product is OUR Product





Moulding for others is our sole source of business. Our entire staff of expert engineers and designers is devoted to the customer's plastics problems — your problems. Our trained sales engineers are prepared to work on these, with you, in your plant.

Furthermore, all of our dies are carefully designed and precision made in our plant — an immediate and long-range saving in money to you and added assurance of an uninterrupted plastics moulding schedule to meet your production needs.

You can depend on Worcester Moulded Plastics to protect your reputation, with Custom Mouldings of Custom Made Quality. Visit our plant to see firsthand how our methods and equipment can help you. We will gladly send our plane for your visit.

Custom Injection Moulding

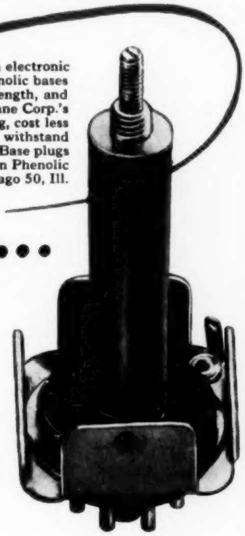
WORCESTER MOULDED PLASTICS CO.

14 HYGEIA STREET, WORCESTER 8, MASS.

17 East 42nd St., New York 17, N. Y.

Accurate and easily assembled deflection-yoke half spools for TV tubes. Molded of phenolics to close tolerances, with thin, warp-free walls and rims. Permit precise control of electron stream, resist high voltages. Molded by Shaw Insulator Co., Irvington 11, N. J.

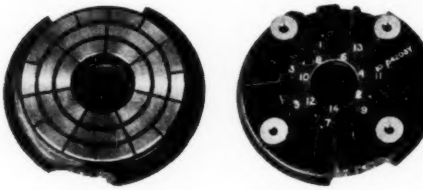
The housing, base, and handle of this glycol vaporizer are always comfortable to the touch because of the low thermal conductibility of the BAKELITE general-purpose phenolic material from which they are produced. Excellent electrical insulating qualities and lasting fine appearance are other features.



Low loss. Plug-in electronic components with phenolic bases of high dielectric strength, and coil forms made of Synthane Corp.'s phenolic laminated tubing, cost less to make and replace, withstand vibration, humidity. Base plugs molded by American Phenolic Corp., Chicago 50, Ill.

Where the Going Is Toughest...

BAKELITE PHENOLIC PLASTICS WHIP THE PROBLEMS!



High stresses are set up by wide differences in expansion coefficients of brass inserts and phenolics, and by mold shrinkage. Yet not one of these distributor blocks and collector plates has ever cracked. Molder: Scintilla Magneto Div., Bendix Aviation Corp., Sidney, N. Y.

Born to take a beating, these four products take it and like it . . . because they all use BAKELITE Phenolic Plastics.

Available in many grades for a number of specific electrical applications, BAKELITE Phenolics provide easy, fast moldability, smooth surfaces, and resistance to moisture, chemicals, oils, greases, temperature changes, vibration and strain.

Thus, BAKELITE heat and impact resistant phenolic BM-250 is the base material for distributor blocks and collector plates of the new low-tension ignition system for high power aircraft engines. The material resists the extreme expansion stresses of temperatures changing from minus 65 to plus 250 deg. F.

BAKELITE "low-loss" phenolic BM-16981 is employed by Dietz Design & Mfg. Co. for their "Desco" plug-in assemblies, designed for easy stud mounting of coils, relays, filters, and crystals. The material provides excellent electrical insulating characteristics for high-frequency service, even under humid conditions.

BAKELITE general-purpose phenolic BM-17849 provides the critically accurate dimensions required in the deflection-yoke half spools for RCA television picture tubes. A BAKELITE general-purpose phenolic is used also for the sturdy, handsome base, cover, and handle of the "Rex" Glycolator made by the Iron City Chemical Company for sick room and hospital service. Permanence of finish, electrical resistivity, and low thermal conductivity are a few of the features gained through use of this material.

Although your "problem" is different, there may be a BAKELITE Phenolic Plastic for your exacting specifications – to lower costs, improve quality, increase sales. Let us know your needs. Write Dept. CT-13.

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